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"In adopting our title of the *Journal of Mental Science*, published by authority of the *Medico-Psychological Association*, we profess that we cultivate in our pages mental science of a particular kind, namely, such mental science as appertains to medical men who are engaged in the treatment of the insane. But it has been objected that the term mental science is inapplicable, and that the term mental physiology or mental pathology, or psychology, or psychiatry (a term much affected by our German brethren), would have been more correct and appropriate; and that, moreover, we do not deal in mental science, which is properly the sphere of the aspiring metaphysical intellect. If mental science is strictly synonymous with metaphysics, these objections are certainly valid; for although we do not eschew metaphysical discussion, the aim of this JOURNAL is certainly bent upon more attainable objects than the pursuit of those recondite inquiries which have occupied the most ambitious intellects from the time of Plato to the present, with so much labour and so little result. But while we admit that metaphysics may be called one department of mental science, we maintain that mental physiology and mental pathology are also mental science under a different aspect. While metaphysics may be called speculative mental science, mental physiology and pathology, with their vast range of inquiry into insanity, education, crime, and all things which tend to preserve mental health, or to produce mental disease, are not less questions of mental science in its practical, that is in its sociological point of view. If it were not unjust to high mathematics to compare it in any way with abstruse metaphysics, it would illustrate our meaning to say that our practical mental science would fairly bear the same relation to the mental science of the metaphysicians as applied mathematics bears to the pure science. In both instances the aim of the pure science is the attainment of abstract truth; its utility, however, frequently going no further than to serve as a gymnasium for the intellect. In both instances the mixed science aims at, and, to a certain extent, attains immediate practical results of the greatest utility to the welfare of mankind; we therefore maintain that our JOURNAL is not inaptly called the *Journal of Mental Science*, although the science may only attempt to deal with sociological and medical inquiries, relating either to the preservation of the health of the mind or to the amelioration or cure of its diseases; and although not soaring to the height of abstruse metaphysics, we only aim at such metaphysical knowledge as may be available to our purposes, as the mechanician uses the formularies of mathematics. This is our view of the kind of mental science which physicians engaged in the grave responsibility of caring for the mental health of their fellow-men may, in all modesty, pretend to cultivate; and while we cannot doubt that all additions to our certain knowledge in the speculative department of the science will be great gain, the necessities of duty and of danger must ever compel us to pursue that knowledge which is to be obtained in the practical departments of science with the earnestness of real workmen. The captain of a ship would be none the worse for being well acquainted with the higher branches of astronomical science, but it is the practical part of that science as it is applicable to navigation which he is compelled to study."—Sir J. C. Bucknill, M.D., F.R.S. (*Journ. Ment. Sci.*, vol. vii, 1861, p. 137).



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Part I.—Original Articles.

THE TWENTIETH MAUDSLEY LECTURE: INTELLIGENCE AS A SOCIAL PROBLEM.*

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In 1895, as many people here are likely to know, Henry Maudsley combined two of his earlier books into his famous *Pathology of Mind*. Very near the beginning of this volume, he laid unusual emphasis upon the paramount importance of a study of social conditions in relation to human conduct in general and the varied forms of mental illness in particular. "The study of the individual as an element of social pathology," he declared, "will plainly be a long, laborious, and difficult business of the future." He was right. Fifty years have gone and, in spite of many notable contributions, it is a study still in its infancy.

Maudsley's statement, it will be noticed, was a peculiar one. He referred to "the individual as an element of social pathology." But when he went on to write a long sociological chapter which is still extremely well worth reading, he seems to have reversed this and to be thinking almost entirely of society as an element in individual pathology. I am proposing to try to go back to the original assertion in what seems to be its literal interpretation. One initial comment I must make. As an experimental psychologist it would, of course, be entirely wrong for me to claim any expert knowledge of pathology, individual or social. But there are many matters which are of common interest to the student of normal psychology and the investigator of aberrations in human development. I propose then, taking what is known or suspected about intelligence in the light of current research as my special topic, to consider how qualities which can be treated only as individual, may, by a complex interplay of influences, threaten to produce difficulties which, unless they are directed

* Delivered before the Royal Medico-Psychological Association, November 27th, 1946.

and controlled, will seriously interfere with any achievement of the balanced development of society.

All the main contributions to the systematic study of intelligence came later than Maudsley's period of activity. It is true that Ebbinghaus, a man of brilliant and original powers, had considered, invented and used an intelligence test years before. His scheme, the filling in of blanks in continuous prose, is still employed, and in fact it does involve most of the principles used by verbal tests of intelligence, and now usually illustrated in separate and specific items. Binet was developing a different technique, and Francis Galton, with his irrepressible originality and daring, had made suggestions which carried the seeds of later tremendous developments. But none of this had yet a widely recognized practical significance, and it is not surprising that one looks in vain for any specific discussion of intelligence by Maudsley. Indeed, it was not until Burt, Spearman and others, realizing the possible tremendous educational potentialities of intelligence testing, began the large scale statistical analysis of intelligence test results, that there was any wide admission that a new practical device of far-reaching social importance had appeared upon the scene. And why not? Such a device could first become effective only in a community which had long accepted a large measure of popular education.

Once introduced, the movement to test intelligence was bound to spread rapidly, and so it did. All sorts of people rushed into the field with all sorts of tests, proposed to serve all sorts of purposes. About the tests clustered theories concerning the nature and structure of intelligence which are still hotly debated. It seems fair to say that the simple earlier views, according to which intelligence was thought of almost as a single quantity, fixed in early years and remaining available until, at some indefinite age phase deterioration might set in, have to be abandoned. At any rate, if the most recent type of statistical analysis is to be accepted—which doubtless remains debatable—it seems that whatever it may be that is explored with a modern battery of intelligence tests, it is a very complex function to which some twelve different factors contribute. There is, perhaps in addition, a central "second order" factor, which Spearman called *g*, that influences all the others, but does not necessarily set them into a form of concomitant variation (1).

However this may be, the main general interest in and justification of intelligence tests is pragmatic, and in this respect their use does not in any way depend upon views about the precise psychological nature of intelligence. It is incontestable that the application of the tests has made it possible to predict successfully, in a statistical sense, certain forms of success which are widely valued in present-day society. In particular, probable academic success or failure can be foretold. But not academic issues alone are implicated. It is often claimed, and the claim meets with widespread sympathy, that the same intelligence tests will foretell, in the same statistical way, success in a very wide range of skills. For skill is a concerted response of mind and muscle which essentially depends upon an accurate and rapid perception of similarities and differences in varied settings, and this is also a leading requirement of any modern comprehensive battery of intelligence tests. And so it is by no means a visionary's dream—or as some would rather put it, an awful nightmare—that

there may come a time when everybody in the modern social group will, from early school days to his industrial or professional prime, carry about with him an intelligence index which will be used powerfully to help to set for him his status and duties in social life. Indeed, already large steps are proposed, in the most public manner, which would lead us, in this country, towards such an end. Let us therefore consider very seriously what sorts of things must be studied and known, if the social implications of a policy of this kind are to be understood.

Intelligence may or may not be an extremely complex function, but at least it is now a common practice for any comprehensive intelligence test sequence to be expressed in three different media or idioms, verbal, numerical and visual. All three, as they are used, are very highly symbolic, for the most approved visual forms, except those for use with very small children, primitive people and some mental patients, are geometrical or other figures of an abstract character. There is much to be said for the view that one of the outstanding characteristics of the intelligent person is a capacity to deal fluently and accurately with symbols. Certainly the bulk of modern educational training is based on that view, and certainly it fairly represents a position adopted and defended by plenty of first-class thinkers, like Hughlings Jackson and Henry Head. Nevertheless, it now seems almost certain that the view is prejudiced and incomplete, and that very serious difficulties are likely to arise in any society which accepts it without reserve.

So far as I am concerned, it was during the recent War that I began to be seriously disturbed by such considerations. It is well known that during the war period intelligence tests, often in conjunction with some others as well, were freely used for purposes of personnel selection. There is a fairly wide belief, and there is some evidence, that they were successful. My own direct experience of these methods was nothing like so extensive as that of many others. But there were in particular two fairly large groups of subjects with whom I had close contact : they were R.A.F. pilots, and some of the Controllers who had charge of the Operations Rooms which directed air manœuvres. Everybody agreed that both of these activities demanded a fairly high level of intelligence. In both cases intelligence tests of an approved modern form were used to assist selection, and in both cases there is no reasonable room to doubt that high scoring on the tests was associated with subsequent success, and low scoring with failure or smaller success. There were, however, a substantial number of exceptions at both ends of the scale, and any impartial examination, either of their frequency or of their character, makes it clear that these are not easily explained. They are not accounted for by the well-known fact that tests of any kind applied to men and women have a statistical significance only ; or by unfavourable circumstances in training or operations ; or by the fact that practically all known intelligence tests lead to bunching at the top end, so that alleged differences between the more highly intelligent, based upon test performance, have very little importance. I began to wonder whether the intelligence that deals with symbols may be radically different from that which deals directly with concrete situations in terms of those situations themselves.

About the same time other anomalies appeared. A widely used R.A.F. test for dark adaptation, which included the identification of representative realistic forms, ran into difficulties owing to the fact that such identification appeared subject to learning to a considerable extent. It was at once suggested that this was because these realistic recognition tests are largely a function of intelligence, though it is obvious that if intelligence as tested is itself affected by learning to any extent, the difficulties in the large scale use, especially of high grade intelligence tests, become enormous. However, trial revealed no consistent relation whatever between the perceptual ranking and the intelligence ranking.

It therefore became very worth while to devise experiments to discover whether grading in what may be called "perceptual efficiency" is possible, and if so, what is its relation to other functions of which the only one that now concerns us is intelligence as measured by the accepted tests. The experiments were carried out. Broadly, they required the identification of objects presented in ambiguous or difficult settings. They were conducted by independent investigators and with differing material. The results, in so far as the possibility of grading perceptual ability was concerned, agreed well. The case cannot be regarded as proved, but it is at least highly probable that perceptual efficiency can be measured, that it remains relatively constant from one situation to another, within limits of the kind of material dealt with, and that it has no consistent relationship with intelligence in the accepted test sense (2). To take a simple case, for example, the speed and accuracy of recording different dial readings when all dials and their scales are constructed in the same way has no necessary relation to intelligence (3). The same is true of the recognition of objects presented from some unusual point of view, as in aerial photography.

What about manipulative efficiency? Here we get a step further still from tackling a problem by means of any interpolated set of symbols. We devised a representative group of experiments in which, for example, some simple mechanical arrangement embodying a familiar device was shown. The subject was then told that a readjustment might or might not be made. He was next asked to say whether the mechanism was the same or different. If he said "different" he was at once asked to put it right; if he asserted that it was the "same" he was required to set the mechanism into action, and if he had been wrong, to make it work. There were a good many other variations on the same theme. Once again, while it cannot yet be said to be fully proved, the results show that it is highly probable that, if this technique can be said to get at manipulative efficiency, such efficiency does not vary regularly with intelligence as ranked by the approved tests. Manipulative efficiency defined in this way does not agree very well with perceptual efficiency either. One thing is interesting. There are a fair number of people who can see quickly that something is different in a mechanical arrangement, cannot say at all clearly or decidedly what it is, but can, if required, very speedily and accurately put it right (4).

Admittedly, both perceptual and manipulative efficiency present extremely complicated problems and a great amount of more controlled experiment is required, but nobody will deny that they are needed in all sorts of directions

in the modern social group, and that so long as it remains doubtful whether they bear a known regular relation to tests of intelligence, any large-scale use of the latter alone to determine status and duties must be adopted with extreme caution.

I turn now to another aspect of the same question. In the early years of the war intelligence test results were collected from a very large number of people entering the Fighting Services, together with a record of their pre-war employment. There is, of course, room for error in the employment records, but they are likely to have been substantially correct. As a sample, ten thousand of these intelligence scores were sorted into employment groups, and if we make the assumption that when a man remains in fairly regular employment there can be nothing in its demands at serious variance with his intellectual equipment, we can deduce the range of intelligence which any given trade or profession can tolerate. The only striking differences appeared at the top and the bottom of the total range. The great majority of the occupations required in a modern community are, it seems, so far as intelligence goes, available to the great majority of its citizens. This is, of course, exactly what a general survey of pre-war industry, with the almost total absence of specific selection, would lead one to expect (5).

One implication seems absolutely certain. As every psychologist who is not woefully biased would be willing to agree, practically all measures of human function are measures of range. Indeed, hardly anything else could happen. All human activities are built up in a world of change. They remain stable within a certain range of normal change, and then outside that range are apt to break down, often suddenly and dramatically. The astonishing mechanism of adaptation very often sets steps of range, and the important thing is to know when we move from one step to another. Intelligence measures are no exception, and it seems certain that for the great bulk of avocations the range differences that are important are very much fewer than the measurable differences.

To this there may well turn out to be one vastly significant exception, well-known, but up to the present very little regarded. Practically every set of intelligence tests in common use at present produces a great bunching up in the top range. So while the nature of intelligence in relation to occupation probably makes their scores not very discriminatory in the middle range, the present nature of the tests makes them even less so in the upper range (6).

Lastly, so far as the present line of reflection goes, there is a vast and so far largely unexplored field of problems concerning the effect of test repetition. This has not been an important practical question until lately, and its theoretical significance has been less fully realized than should have been the case. In both ways it has now become vital. We now know that the repetition of tests may push up a person's test score, especially with adults, far more than has been generally recognized. This does not much matter for the purposes of inter-group comparison, since the improvement curves will run roughly parallel. But if scores are used in an absolute sense to assess a person's grade in a total community it may matter a very great deal. How and how much it matters nobody knows, but until we find out the utmost caution is essential.

Let me sum up and then move briefly to a different, though related, field of thought. There is evidence, but not yet complete proof, that the present approved intelligence tests, by their preoccupation with symbolic efficiency, may entirely by-pass forms of skill which are of growing significance in an industrialized and mechanized civilization. Such tests have little discriminatory value in the middle range, and less discriminatory capacity in the upper range. Repetition of tests may perhaps so affect performance as to render interpretation of scores excessively difficult.

Now perhaps the real distribution of intelligence remains constant from age to age, in any sufficiently large population, whatever the state of popular education. Nobody knows. But certainly the apparent distribution varies if it is based upon performances requiring the efficient use of symbols which are the direct concern of education. There are several good and well authenticated recent studies which indicate that about 1 in 5 of the total present school population of this country reaches an intelligence level likely to guarantee success in University examinations (7). The same methods would certainly not have yielded the same results when Maudsley wrote his great book. It is not silly to imagine that there may come a time when the whole school population, except the mentally defective may, by the same methods, be shown equal to University educational standards. What then? Are we to conclude, as many now openly do, that all those who reach this level should proceed to a University? Obviously, apart from the fact, which I hope I have shown, that the methods may stand in need of much revision, there are other considerations which are of great social weight. We do not know for certain what vocational and professional preferences are set up by a University training. But investigations like the recent extremely interesting Cambridge study of post-graduate careers make it exceedingly clear that such preferences bear no balanced relation to the vocational and professional demands of modern society (8). Already a large number of men and women have to fall back upon second, third and fourth preferences. We may very well be approaching a state in which a very large number, perhaps the majority, will not be able to secure even that degree of satisfaction in terms of their own preferences. Indeed already every year increases the severity of the problem of the "unwanted trade." It is a problem which demands most serious research from many points of view. Among these the psychological is certainly not the least important. Yet, in this country at least, no opportunities seem to be offered or contemplated for its scientific investigation.

The situation is a strange one. The phrase "intelligence as a social problem" probably makes most of us think of the retarded and the mentally defective. It is the "good average" or the "above average" intelligence that constitutes the problem of which I am speaking. We rate intelligence mainly in terms of the symbols of words, numbers and abstract forms. We foster every educational device to make these symbols more and more widely familiar and their effective use easier. At the same time we shut our eyes to the fact that we are building an accumulation of limited preferences and a scale of social values heavily weighted towards a small group of social functions and activities. And we develop a heavily industrialized civilization, many of

whose human demands are totally at variance with these preferences and these values. The price may be a piled-up mass of individual frustration and disappointment which are the nursery of a sick society.

Intelligence is a quality of the individual. We are therefore back to a most literal application of Maudsley's prophetic phrase, "the individual as an element of social pathology."

It is easy to point these things out : futile unless the effect is a search for solutions. Certainly no sensible person would wish to reverse, even if he could, the expanding course, to change the essential media and character of education. It may be that social values will be altered, until every kind of effective skill will be recognized as carrying a similar and equal claim to what are called the good things of life. It may be—and I think this is far more likely—that society will at length be forced to study seriously the conditions of its own enormous power of productivity, and not simply to talk about it and to appoint some of its citizens to exhort the rest of them to work. Then we can have, as many people have dreamed, an education, especially an academic education, for leisure, consistent with every other kind of training that developing society may need.

Whatever the solution, it can have no sure basis except in fundamental research into the nature of men and the claims of society. Already there is the most urgent need for more penetrative and catholic investigations into the structure of intelligence and the nature and conditions of intelligent activities. Without this we can only go on groping in the dark, or applying methods in a more rigid manner than is justified.

I have chosen to speak about intelligence because it already presents an outstanding illustration of a difficulty which is developing rapidly in modern society in many directions. Every society which at one and the same time sets itself to extend, foster and encourage individual qualities, and to produce a social order which inevitably denies those qualities free expression in the case of many individuals, is asking for trouble. It matters little, for a variety of reasons, so long as the effective groups in society are small. But as the ruling groups grow larger and larger and their demands become both more compelling and more uniform for all their members, there comes inevitably a stage when such discrepancy piles up problem after problem. It seems to me a matter of most vital importance that this and other essential differences between the large and the small social group should be studied and understood. I do not know at what stage of increasing size discrepancies between the qualities and their functions which are sought for the individual, and the needs and their activities which are demanded by society, become an acute threat to social order. But I am convinced that that stage has been reached already in many respects over the whole civilized world, and that in many other respects it is rapidly approaching. There is need as never before for the kind of study which Maudsley, with great wisdom, called for long ago. Disaster can be averted and progress can be assured only if man learns at length to use those scientific principles and methods which he has discovered and of which he is justly proud, to increase his knowledge of himself and to direct his social achievements.

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TEN YEARS' EXPERIENCE OF INSULIN THERAPY IN SCHIZOPHRENIA.*

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INTRODUCTION.

MORE than ten years have elapsed since insulin therapy was first introduced in this country as a treatment for schizophrenia. This should gradually enable us to form a more accurate opinion as to its value. An enormous literature has accumulated on the subject. Only some samples of it, representing the different views expressed, can therefore be mentioned. It is here attempted to apply some common criteria which are indispensable for the assessment of the effects of treatment, which it is hoped may lead to a clarification of the present position of insulin therapy.

What are the difficulties in evaluating the effectiveness of this method? Is there an optimum technique for achieving the best results? Why do some investigators come to discouraging conclusions? What is the opinion of the majority of workers on insulin therapy?

A. Lewis (1945) states that "the chief reason . . . why ten years after the introduction of a new method we are still uncertain about its range and effect are to be found in the complexity and nature of psychiatric data." Many criteria for analysing results have been suggested by different workers. It is well known that the diagnostic criteria of schizophrenia are by no means uniform. As Cook (1944) states in his review on Convulsion Therapy, "Schizophrenia has no clear cut frontier. There is a no man's land of 'acute schizophrenic reactive states,' 'confusional psychoses,' 'atypical schizophrenias,' etc., which tend to run a self-limited course." The inclusion of these states in varying degree under the term schizophrenia considerably alters the number of spontaneous remissions. It is most important, therefore, that the same criteria are applied to treated and non-treated cases, used as controls. The same standards are most readily achieved if one doctor or at least the same team of doctors are employed in the work. For that reason each hospital has to rely largely on its own experience. The results reported are, therefore, often based on a small number of cases, as each therapist must perforce have limited case-material.

It is generally agreed now that the response to treatment is largely depen-

* A paper read at the Quarterly Meeting of the Royal Medico-Psychological Association on November 27, 1946, at 11, Chandos Street, W. 1.

dent on the duration of illness. Cases, therefore, tend to be admitted earlier than in the pre-insulin days. Another question is how far the enthusiastic therapist is tempted to discharge his treated patients earlier than was previously the custom, partly to try them out and partly to make room for fresh cases.

Definitions of the quality of improvement vary greatly amongst different workers (Cook, 1944). The assessment of the degree of improvement immediately at the termination of treatment may be misleading, because it is known from past experience that many forms of physical interference may result in transitory remissions. The predominantly temporary character of such remissions is confirmed in a recent study on the modification of mental illness by intercurrent physical disorders by Clow and Prout (1946). They state that "the change was of a relatively minor degree and more closely limited to the period of actual physical illness." To avoid possible errors results of treatment should be assessed 1 to 2 months after its termination.

TECHNIQUE.

M. Müller (1939), as well as Rivers and Bond (1942), have shown that the technique has a very important bearing on results. Danziger (1945/6), using a statistical method, was able to demonstrate that there is a certain minimum standard of adequacy of treatment. Lipschütz, Cavel and Leiser (1939) made a special study of this problem. They used only cases with a duration of illness of more than 1 year. Patients were divided into several groups receiving different varieties of treatment. Either coma-treatment was given alone or in combination with resocialization activities. One group received only saline injections; another was subjected to resocialization activities alone. When the treatment was not carried to coma level little or no improvement resulted. The best results followed deep coma treatment combined with resocialization activities; the poorest recovery rates were seen in the group receiving only ordinary hospital care. This demonstrates that the production of comas is an important therapeutic factor, which cannot be equalled by any other method tested by the above authors.

What is the technique that should be employed? It is not intended to discuss it in detail, but only what should be regarded as adequate treatment. For detailed information on technique Sargant and Slater's book on physical therapy in psychiatry may be consulted. The production of comas is essential for the achievement of good results. They should be of sufficient depth, must be clearly defined, and a certain number of them should be administered. The insulin dosage should be increased if comas are too light. A total of about 50 comas should be aimed at, even if patients remit early in treatment. Such a total improves the degree of recovery and makes the result more lasting. Our own experience shows that the quality of results is definitely better when more than 30 comas have been given. Long treated cases could often be re-categorized from social into total recoveries after living outside for some time (Table 1).

Many workers combine insulin therapy with convulsants. Cook (1944)

emphasizes that there should be "no rivalry between insulin and convulsion therapy," as both are complementary. Most workers agree that convulsive treatment in schizophrenia increases the number of remissions, and also improves their quality as compared to spontaneous remissions. Its beneficial effect is most evident in the more florid type of schizophrenia. The majority of workers

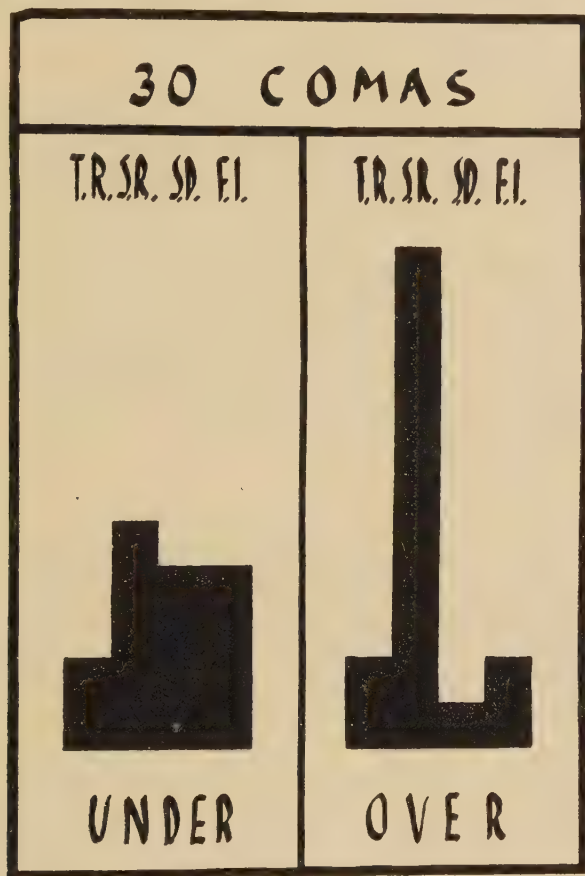


TABLE 1.—This table demonstrates that in cases able to leave hospital total plus social recoveries are obtained more frequently if the number of comas exceeds 30 per patient. Only cases with a duration of illness of up to 18 months were selected for this purpose. Each square = 1 patient.

also confirm that insulin is more "consistently beneficial in all types of schizophrenia" (Cook 1944), but Kalinowsky and Worthing (1943) maintain that results by either method are similar if the treatment has been adequately carried out. Differences in response to convulsants and insulin were demonstrated by Gralnick (1945). In a group of 158 schizophrenics treated with insulin 52.5 per cent. were discharged regardless of the duration of illness, compared with 20 per cent. of 209 treated with E.C.T. His results with insulin are much superior to those achieved with E.C.T., and he is unable to agree with Kalinowsky that schizophrenics benefit by prolonged courses of

E.C.T. The beneficial effect of E.C.T. on the affective psychoses is indisputable. As an admixture of depression, elation, apprehension and agitation are very often seen in schizophrenics, the combined use of insulin and E.C.T. may be justified. It is not yet clear, however, whether higher recovery rates are achieved by the combined method, although it is claimed by some workers (Chapuis and Georgi, 1945). It has also been our practice to use E.C.T. or cardiazol in combination with insulin. Its indications usually are:

- (1) Marked manic-depressive features.
- (2) Marked excitement, restlessness and stupor.

In these two symptom groups a prior course of E.C.T. or cardiazol is often given. The improvement obtained is frequently not very stable. A course of insulin comas, therefore, has been given after the preliminary convulsions.

(3) If no results appear with insulin alone after 20 comas, convulsions were added.

(4) Marked resistance to insulin may also sometimes be overcome by a fit (Mayer-Gross, personal communication).

The dangers of the combined method are not greater than those with insulin alone. In our series the total of convulsions applied has been usually 4 to 8 per patient. This combined treatment appears less harmful than treating schizophrenics with 30 or more E.C.Ts.

RESULTS OF OTHER WORKERS.

An extensive study with discouraging conclusions has been published by Penrose (1943/44). He studied 1,600 patients treated with convulsions and insulin. The group which received convulsants was 5 times greater than that treated with insulin. His conclusions refer to the whole shock-treated group, and he states that "very little support is provided for the view formerly widely held that shock treatment (E.C.T. and insulin) has any value in schizophrenia." He has the advantage of a large series of treated cases which were, however, collected from various hospitals, and therefore diagnosed by different workers. No information is given as to the duration of illness, the technique of insulin treatment, or the number of comas given. His treated material is compared with a control group in which the diagnosis was made with a new statistical method—according to age-groups and sex—including defectives, seniles and alcoholics. A great deal of overlapping of different diagnostic entities seems unavoidable with this method, and therefore control groups compiled in this way do not appear satisfactory for estimating the value of treatment (see Penrose (1943), Chart 1). Penrose did not give sufficient consideration to the indispensable criteria for estimating results. His report can, therefore, not be accepted as a final verdict on the value of insulin therapy.

The same applies to the observations of Starker, Miller and Jacobs (1939), who also come to the conclusion that insulin is not of much value. Their series was very small, and it appears that they gave insufficient consideration to the duration of illness.

Gottlieb and Huston (1943) compared the results in 66 schizophrenics with a carefully selected non-treated group of 132 patients of the same diagnosis.

They state: "Insulin does not increase the chances of recovery or shorten the duration of hospitalization." Their method of treatment consisted only of 30 injections of insulin, and the insulin dosage was decreased as soon as comas were obtained. This insufficient amount of treatment cannot be expected to produce satisfactory results. The same remarks apply to Rennie's conclusions, whose patients were treated at the Henry Phipps Psychiatric Clinic. The average number of *injections* (not comas) was only 36, which is again lower than the number of treatments given by workers who report favourably on the method.

In contrast to these unfavourable reports there are investigations which take the main fallacies mentioned previously into consideration. Large numbers of adequately selected and adequately treated patients matched against a comparable non-treated group confirm the definite value of this treatment in schizophrenia. Comparisons between treated and non-treated patients from the same hospital are the most satisfactory way of demonstrating the efficacy of insulin treatment. Only very few reports are available which comply with this condition. One of them, published by Rivers and Bond (1942), based on their experiences in the Pennsylvania Hospital in Philadelphia, tells us of 188 patients treated with insulin compared with a control group of 116 non-treated cases. The same diagnostic criteria and the same method of estimating results are used throughout. For their total number of treated cases they report a remission rate of 65 per cent. at the end of treatment, 42 per cent. at the end of one year, 36 per cent. after two years and 31 per cent. after three years, which is still twice as high as the number of remissions in the control group. They also compare results in two different groups of patients. In the first one the insulin treatment was tentative. Different physicians were in charge of it; the dosage was kept as low as possible and reduced as soon as the coma dose had been reached. In this group only 46 per cent. of the patients were recovered or much improved at the end of treatment. In the second group the insulin treatment was in the hands of one physician. Deep and long comas were produced and the insulin dosage was kept higher. Here 79 per cent. of the cases were discharged recovered or much improved at the end of treatment. The total of their insulin patients enjoyed 251 years of health out of a possible 564, and the non-treated cases 78 years out of a possible 551.

A most instructive survey was published by a Temporary Commission on State Hospital Problems in New York entitled "Insulin Therapy." Its special value lies in its size, and that all patients were treated in the same hospital. It deals with 1,228 dementia praecox patients and a non-treated group of 876 patients. This was very carefully selected, though collected from different hospitals. No other report has been compiled with the same thoroughness and care. Social service workers were used to estimate the ability of patients to live in a community at various levels of usefulness. The patients in both the treated and the non-treated groups were properly graded, even those in hospital. All those able to leave were followed up personally at home. 79.5 per cent. of the treated patients were able to leave hospital against 58.8 per cent. in the control group. The patients are divided into the usual diagnostic sub-groups: catatonics, paranoids, hebephrenics, simple and others. "In

each group a larger percentage were able to leave hospital among insulin treated patients than among non-treated patients." The success of treatment was tested apart from the ability to leave hospital, by the length of stay in hospital, the length of time those leaving hospital were able to remain in the community, and the extent to which those returning to the community are restored to usefulness. In insulin patients the period of hospitalization was 3.8 months shorter than that of the non-treated group. A larger proportion of the treated group was doing useful work after discharge. The insulin group showed a larger number of patients who did not return to hospital. Five and a half years after discharge 58.9 per cent. of the patients were at home as compared with 44 per cent. in the non-treated group. Even patients with a duration of illness of more than one year showed better results than similar non-treated patients.

Good results with insulin are also reported from the hospitals of the State of New Jersey. Since this treatment was introduced 61.9 per cent. of schizophrenics have been discharged compared with only 39.3 per cent. before its introduction.

The least discrepancy is shown between reports by experienced specialists in insulin treatment. Especially when the examination before and during treatment and the estimation of the degree of improvement, including the follow-up, are made by the same investigator. Two follow-up studies of this kind have appeared. Chapuis and Georgi (1945) report on 81 cases observed over a period of 5 to 7 years. 70 to 80 days of hypoglycaemia were usually given combined with 10 to 20 convulsions. 70 per cent. of their remissions remained stable for 5 years, and this figure was still more than 50 per cent. after 7 years. The full remissions proved the most stable. Braunnmuhl reports on 563 cases. He found that most relapses occur within the first year after treatment, and that many could be successfully re-treated. Braunnmuhl's relapse figures for his whole material during the first five years after discharge in cases of less than 6/12ths duration of illness are 9.6 per cent. for the cures and 32 per cent. for the improved. In cases with a duration of illness of half to one year 22.8 per cent. of the cured and 8.7 per cent. of the improved relapsed. In those whose illness had lasted more than one year 28.3 per cent. of the cured and 12.8 per cent. of the improved had to be readmitted to hospital.

In Swiss and German reports the ratio between results in treated and non-treated cases is usually about 2 : 1 (quoted by Kalinowsky and Hoch, 1946). A similar relation is revealed by the figures compiled by Ross and Malzberg (1939) collected for the Department of Mental Hygiene of New York.

RESULTS OF INSULIN THERAPY AT MOORCROFT HOUSE.

The material here considered consists of 112 schizophrenics treated at Moorcroft House during the past ten years (Table 2). Results were assessed two months after the termination of treatment. Patients relapsing during that period were regarded as unimproved. Results are classified according to the definitions put forward by E. Guttmann, Mayer-Gross and Slater (1939), into total recoveries, social recoveries, social defects, family invalids and hospital invalids. Amongst the cases with a duration of illness of under one

year 80.1 per cent. were able to leave. Of patients ill from one to three years 53.6 per cent. were fit to return to the community. Where the illness had lasted more than three years only 28.6 per cent. could be discharged.

It can be seen that our discharge rate of cases with a duration of illness of under one year corresponds very closely to the American series. There,

RESULTS WITH INSULIN THERAPY.

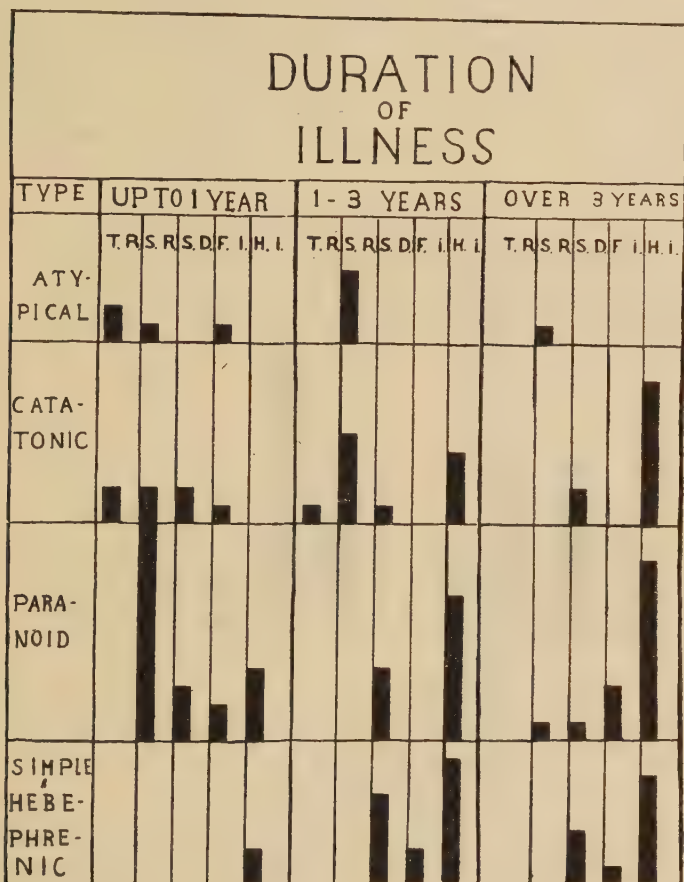


TABLE 2.—This table shows that results are dependent on the duration of illness. The number of hospital invalids increases with the duration of illness. Atypical cases do best. The next most favourable are catatonics. Paranoids follow, and hebephrenics do least well.

Each black square = 1 patient.

82.5 per cent. were able to leave as compared to 60.4 per cent. in the non-treated group. Our discharge figures for patients with more than one year's illness were less favourable.

Patients were also classified according to the clinical type to which they belong. It is seen on the chart that atypical cases characterized by an admixture of manic-depressive or confusional features do best. The next most favourable results occur with catatonics. Paranoids follow, and simple and

hebephrenics seem to do least well. This confirms reports by other workers. Results in hebephrenics appear much lower than in the New York report. There is a decrease in the quality and quantity of improvement as soon as the duration of illness exceeds one year.

Thirty-four of the patients able to leave hospital have been followed up (Table 3). Some examples of these cases may be of interest to demonstrate the quality of results of treatment. Atypical cases have so far proved the most stable, and none of them has relapsed. One patient, a total recovery, has been living a normal life for $9\frac{1}{2}$ years; he has served in the Navy during the war and gained a commission. Two social recoveries have lived normally for 6 years; one served in the R.A.F. as a F./Lt., and the other married and is fulfilling her household duties very satisfactorily. Both could be reclassified as total recoveries.

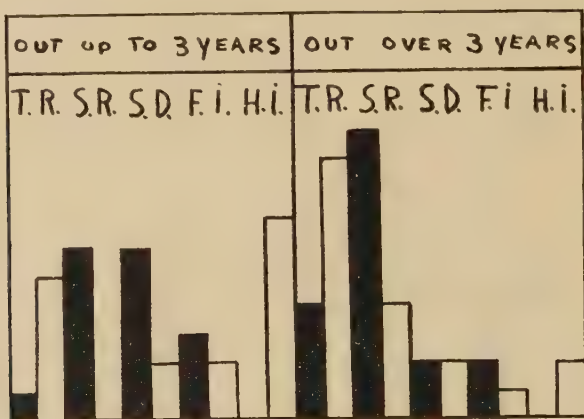


TABLE 3.—This table contains followed-up patients who had been able to leave hospital at the termination of treatment. The number of relapses is higher during the first three years after discharge. These are less frequent in cases out over three years.

Each square = 1 patient.

Black = condition at termination of treatment.

White = condition at time of follow-up.

Amongst the followed-up catatonics, one total recovery has been stable for $9\frac{1}{2}$ years; he served in the Royal Artillery during the war, is happily married and has one child. Another has been running her household for the past 9 years. She has had two more children since her discharge, and has remained well in spite of exceptional emotional stress and the fact that her breakdown had occurred in the puerperium. A further total recovery has been working successfully as a surgeon for $7\frac{1}{2}$ years since her discharge from hospital. One of the social recoveries has remained stable for over nine years, and is working satisfactorily as an assistant water engineer. A further one has been out nearly five years and could be reclassified as a total recovery. He has married since discharge and is doing forestry work. One social recovery relapsed after three years, and got well again after a second course of treatment. No relapses have been observed in patients classified as total recoveries, but two social recoveries and one social defect had to return to hospital.

In the paranoid group several social recoveries could be reclassified as total recoveries. One of these has lived outside for $6\frac{1}{2}$ years, and is working successfully as an estate agent and auctioneer. A second has been discharged for $2\frac{1}{2}$ years. She has done strenuous war work, and is now working as a teacher in a riding school. Another is studying law, having been well for over 2 years. One social defect could be reclassified as a total recovery just over one year after discharge, having lost all her psychotic symptoms. One social recovery, discharged for $1\frac{1}{2}$ years, is a University student, and has passed examinations with second class honours. Three of the social recoveries relapsed after 1 year, 17 months and 3 years respectively. Two of them remain hospital invalids. One patient could be discharged as a social recovery again after a second course of treatment.



TABLE 4.—Results of leucotomy in patients unimproved by insulin.

Black = condition at termination of treatment.

White = condition after leucotomy.

The last white column on the right represents improved hospital invalids.

Our follow-up results confirm those of Chapuis and Georgi (1945), who found that total recoveries are maintained better than social recoveries, and that most relapses occur within the first three years after discharge. A betterment of the degree of improvement after discharge has also been reported by other workers (Müller, 1939).

One patient who has remained a hospital invalid after the termination of treatment made a spontaneous recovery about 8 months later and has been working as a doctor for about 7 years. He has no insight into his past psychotic attack. A second started to improve 2 years after termination of treatment,

and remained in the community for a further 2 years before she relapsed again.

The follow-up revealed that 18 patients who had shown no response to insulin had a subsequent leucotomy performed (Table 4). Of these, 16 were hospital invalids at the end of insulin treatment, 1 was a social defect and 1 a family invalid, and both relapsed. After leucotomy, 2, both paranoids, made a total recovery. They had received a full course of 50 comas combined with E.C.T. Two were discharged as social recoveries and 2 as social defects. Three became family invalids. Another 5 are very much easier to handle inside hospital and the rest are unimproved.

As it proved impossible to compile our own non-treated control group, it may be permissible to compare our follow-up results with a group of non-insulin treated patients, specially selected for their good prognostic outlook at the Maudsley Hospital by E. Guttman, W. Mayer-Gross and E. Slater (1939). Atypical schizophrenics were excluded from our material; also all

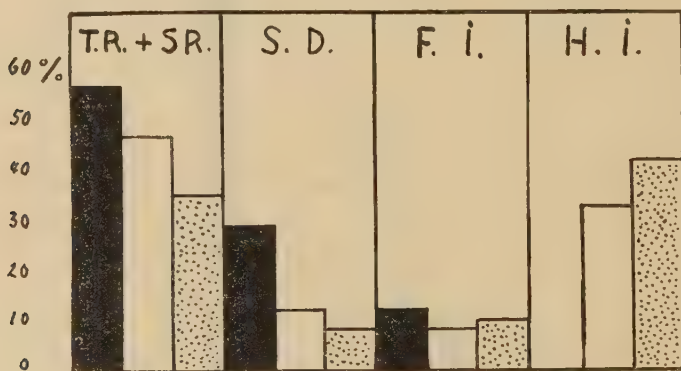


TABLE 5.—This table is made up of patients with a duration of illness of up to one year.

Atypical cases are excluded.

Black = condition at termination of treatment.

White = condition at time of follow-up.

Stippled = non-insulin-treated control.

cases whose illness antedated admission by more than one year were excluded from both the insulin-treated and the control group. The total of followed-up cases, able to leave hospital at the termination of insulin treatment, composed of cases living out of hospital for nearly ten years, is compared with the above-mentioned non-insulin-treated group which had been followed up to an average period slightly exceeding three years. A comparison should actually be to our disadvantage, because the figures of Guttman, Mayer-Gross and Slater would probably be less good had their observation extended to a similarly long period. They state that if any treatment should offer better results than the spontaneous recoveries they reported, then "this method would be definitely justified." Amongst our cases total recoveries plus social recoveries amount to 56 per cent. at the end of insulin treatment and 46.4 per cent. at the time of the follow-up as compared to 34.5 per cent. in the above quoted control group. 32.1 per cent. became hospital invalids in the insulin-treated material and 41 per cent. in the control group (Table 5). This

is further evidence that insulin treatment, if properly carried out, increases the number and quality of recoveries, assuming that the diagnostic criteria of the insulin-treated and the control group can be considered equal, and that the non-insulin-treated patients really represent the optimal material for spontaneous recoveries. Insulin is certainly not a panacea for all cases of schizophrenia, and results over a long distance are not yet very satisfactory. But so far nothing superior has been evolved, and until better methods are available it should be more generally used.

In this connection the question arises whether every hospital should take it up, or whether selected hospitals should treat all schizophrenics. This largely depends on the admission rate of patients suitable for treatment to each hospital. The ideal insulin unit is one having about 12 male and 12 female beds, for which only one nurse is required per 12 patients from 7 to 9 a.m. and two are needed on each side from 9 to midday. There should be one sister in charge in addition to the nurses. One doctor would have to spend most of the morning in such a unit. The same nursing strength would be required for about half the number of patients. Therefore a smaller number of patients would make such a unit much less economical to run. To keep the suggested unit supplied between 140 and 150 admissions of recent schizophrenics would be required per year. These could be supplied only by hospitals with an appropriate admission rate of 700 to 800 patients per year. Since many hospitals have a lower admission rate, it would be more economical to have a central unit to be supplied by several hospitals within a given region.

PROGNOSIS.

To make insulin therapy worth while a careful selection of patients is necessary. The type of case responding best to insulin is the same as that having a good prognosis without any special treatment. It is mainly in these cases that insulin increases the number and quality of remissions, shortens the duration of the attack and assures a longer period of health. The prognosis cannot be predicted with absolute certainty, but some criteria can be successfully applied if a decision has to be made as to whether or not insulin treatment is indicated. An assessment of the prognosis is never very reliable on the basis of individual symptoms only. It is necessary to take the whole aspect of the clinical picture into account. The criteria for prognosis remain closely similar to those used in forecasting a spontaneous remission.

Previous observations on the prognosis of schizophrenia (W. Malamud and Render (1939) and O. Kant (1944)) are confirmed. Only a short summary of these findings can be given here. An acute onset is known to be more favourable than an insidious one. A gradual onset, however, does not seem to have such bad significance if the schizophrenia appears in a depressive setting. Long-standing neurotic symptoms usually associated with an insidious onset of the illness generally influence the prognosis unfavourably. They may be of the anxiety, obsessional or hysterical type.

No definite conclusions can yet be drawn as regards the influence of heredity, but patients with hereditary taint often do well with insulin. Schizo-

phrenics below the age of 15 often do not respond well or derive only very temporary benefit. Conflicting reports have been published about the older age-groups. Ross and Malzberg (1939) found that patients over 25 did better than those under 25. The onset of the illness after 40 is considered to be unfavourable by some authors (Chase and Silverman, 1941). Cheney and Clow (1941) find the best prognosis in cases below 30 years of age.

The duration of illness has so far proved to be one of the most reliable guides to prognosis. A correct assessment is often difficult. The best results are achieved in patients whose illness has not lasted longer than one year. After this the improvement figures fall rapidly. This is not the case with patients in whom long symptom-free periods occurred in the course of their illness. In our experience good results may be seen in that type of case with a duration of illness of up to eight years. Catatonics have also responded favourably even when the illness had lasted up to two years. In paranoids no total recoveries or social recoveries were obtained once the illness had endured for more than one year, except in periodic cases.

In an attempt to study their prognostic significance we have tried to list and chart the main mental disturbances found in our material under several headings: (1) Emotional disturbances, (2) disturbances of volition, (3) disturbances of motor activity, (4) disturbances of thought, (5) hallucinations, (6) delusions, and (7) the background on which the picture occurs (Table 6).

Inadequacy and inappropriateness of affect were often seen in favourable cases, whereas dull and apathetic effect, poor contact and autism are usually of bad prognostic import. Among changes in motor activity, the restless, excited and impulsive type seemed to do better than the stuporous one. The prognostic significance of thought disorder appeared to depend very largely on the background on which the picture developed. In an emotionally calm setting associated with clear consciousness this is of worse prognostic import than if it occurs with an excited, elated or depressed state, or clouded consciousness. Auditory hallucinations were often seen in recovering cases, whereas visual ones or hallucinations of smell only very rarely occurred. Florid and changing delusions showed themselves of better prognostic significance than well defined ones. In unfavourable cases there appeared to be a much more massive disturbance of all the functions of the mind than in the favourable ones, in which disorder of mental function seemed to be more diffuse. Almost every single symptom can be represented in favourable cases however. A good prepsychotic personality exhibiting manifold interests and good contact with reality usually tends to have a favourable influence on the outcome.

CONCLUSION.

Insulin therapy has greatly stimulated research, but the hope that something might be learnt from it about the nature and cause of schizophrenia has so far not been fulfilled. Though it has proved a step forward, it cannot be regarded as specific. Physical treatments should not side-track us from research into the basic problem of the aetiology of schizophrenia. New findings in this field might eventually lead to a more specific and still more effective method of treatment.

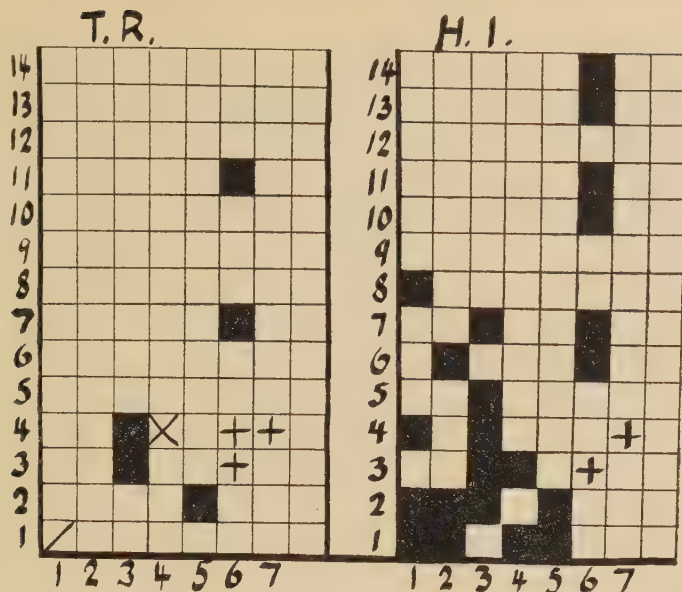


TABLE 6.—In this table the influence of symptomatology on prognosis is illustrated by two examples. A total recovery is tabulated on the left and one hospital invalid on the right. The main mental disturbances are listed horizontally and their subdivisions vertically.

Black signifies severe disturbances.

Two diagonal lines signify a moderate disturbance.

One diagonal line signifies a slight disturbance.

A plus sign indicates present.

1. EMOTIONAL DISTURBANCES.

1. Shallowness of emotional response.
2. Inappropriateness.
3. Rigidity.
4. Indifference.
5. Over-sensitiveness.
6. Irritability.
7. Bewilderment.
8. Solitariness.
9. Dirtiness.
10. Shamelessness.

2. DISTURBANCES OF VOLITION.

1. Lack of decision and determination.
2. Stupor.
3. Suggestibility.
4. Automatic obedience.
5. Ambivalence.
6. Negativism.

3. DISTURBANCES OF MOTOR ACTIVITY.

1. Lack of gracefulness.
2. Apathy.
3. Impulsive action.
4. Excitement.
5. Strange attitudes.
6. Mannerisms.
7. Flexibilitas cerea.
8. Restlessness.

4. THOUGHT.

1. Poverty of ideas.
2. Vagueness.
3. Thought blocking.
4. Lack of logical relationship.
5. Neologisms.

5. HALLUCINATIONS.

1. Visual.
2. Auditory.
3. Smell.
4. Taste.
5. Tactile.

6. DELUSIONS.

1. Well defined.
2. Indefinite.
3. Changing.
4. Florid.
5. Grandeur.
6. Self-reproach.
7. Persecution.
8. Hypochondriacal.
9. Erotic aspirations.
10. Passivity feelings.
11. Misrepresentation.
12. Autochthonous.
13. Reference.
14. Influence.

7. BACKGROUND ON WHICH PICTURE APPEARS.

1. Infectious elation.
2. Depression.
3. Calmness.
4. Clear consciousness.
5. Clouded consciousness.

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THE MAIN MENTAL DISTURBANCES STUDIED WITH THEIR SUBDIVISIONS (see Table 6).

DISCUSSION.

Dr. WILLIAM SARGANT: I feel it is a great honour to have been asked to open the discussion to-day. First of all, I want to congratulate Dr. Freudenberg on his paper. I cannot think of another insulin therapist in the country who can claim the same continuity of treatment experience over so long a period. He therefore speaks to us with a quite unique authority. I think his paper has been a very fair presentation of the advantages and limitations of the insulin treatment of schizophrenia.

My remarks are on my own experiences of insulin shock treatment, which now dates back to 1937. Before the war at the Maudsley Hospital it was possible to try out its effects on most types of schizophrenic illness. On our evacuation to Sutton Emergency Hospital in 1939 the

type of case that we could treat became more specialized. Many were early military cases, sent in among the fifteen thousand or so neuroses which have been through this unit in the past seven years, and the diagnosis of schizophrenia becoming obvious on further investigation. Other cases were clear-cut schizophrenics from the start, but with a symptomatology which made their treatment possible in the open wards of a general hospital, to which the neurosis unit was attached. We could not always manage the very excited and suicidal patients, but it was surprising the varied types of case we found it possible to handle as treatment was given with an increasing confidence due to increasing experience of its usefulness and limitations in such an environment. Since the end of the war we have kept a male and female insulin coma unit running at Sutton to deal with the same types of case, but in an increasing proportion of civilian admissions. These are thus getting a chance of treatment before they will always accept voluntary patient admission to a mental hospital.

On the basis of the experiences that I have had of insulin treatment for the past nine years, I find myself in agreement with most of Dr. Freudenberg's observations. For a long time now I have felt that the quality of remission, when it is obtained with insulin, is often much better than when the patient is left to struggle out of the illness helped by more conservative measures. I do not think Dr. Freudenberg made enough of this point. Perhaps the deterioration is less because the illness may be so much shortened by the treatment. In just over eleven hundred patients treated at the Brooklyn State Hospital it was estimated that no less than 286,695 hospital patient days had been saved, compared to an equivalent control group of cases from other hospitals in New York who did not get this treatment. The illness was shortened by an average of three and a half months in each patient; and it was on the publication of this report in 1944 that Governor Dewey made insulin treatment compulsorily available to all needing it in New York State Hospitals.

We know how rapid schizophrenic deterioration can sometimes be: so I have now come to regard the use of insulin treatment in schizophrenia somewhat in the same way as the use of the front-line sedation in the acute battle neuroses of the recent war. Neither treatment can be claimed as a specific cure of schizophrenia and battle neuroses. But both treatments seem able to prevent additional disintegration of nervous function when given at the right time to the right sort of case. Like front-line sedation, insulin shock-treatment should be given at the earliest moment to try to prevent any further aggravation of symptoms. Some patients will progress and worsen despite its use. But in many early schizophrenic patients the illness will be halted, or a very rapid remission may be brought about.

I also find myself in agreement with Dr. Freudenberg's views about the sort of case one should choose for treatment if facilities are unfortunately not available for all. It has been my clinical impression that results are unmistakably better when the illness has lasted only a short time. During the second year of illness they become rapidly less impressive. By the third and fourth year good remissions will have dropped to a very low percentage of the cases treated. But one occasionally gets a surprise when an apparently hopeless or longstanding case stages a substantial measure of improvement. The longer I do this treatment the less I share the dogmatism of some as to what can and what cannot be expected of it in an individual case based on broad statistical deductions. Each patient is at least entitled to careful individual study for the presence of favourable and unfavourable factors such as those discussed by Dr. Freudenberg before being dismissed as unsuitable for treatment.

Dr. Freudenberg's observations on the use of E.C.T. or cardiazol as a substitute for, or as an adjuvant to, insulin treatment has also been the same as ours. In the first year of illness we have found that cases which respond to E.C.T. have failed with insulin. In many more patients, however, it is the other way round. In the second year few seem to respond to E.C.T. alone, although a fair proportion may still be helped by insulin. Some of our most satisfying recent experiences have been in cases not responding to insulin coma, who were immediately helped by being given E.C.T. or cardiazol in the late stage of sopor or early coma. This has occurred in both the first and second year of illness. The combined treatment may also succeed where the two treatments given separately have failed. Other workers have also suggested that such a combination lowers the relapse rate.

I have been asked to say a few words in this discussion about modified insulin treatment. Over fifteen hundred courses of modified insulin treatment have been given at Sutton for various types of neurosis. We have also learned that it is no substitute for insulin coma in the treatment of schizophrenia. It may be better than no insulin at all if combined with E.C.T. But harm will be done to a proportion of cases who are given modified insulin instead of a full coma treatment because their recovery will be delayed and unnecessary deterioration allowed to happen.

One point about relapses. One has heard people say that because relapses happen after treatment it is hardly worth while. I think this shows a lack of a sense of true proportion. Our duty as doctors is to provide the treatment that relieves our patient's immediate suffering as quickly as possible, and promotes their maximum well-being. Earl Bond's follow-up results in his seven years' survey of insulin treatment seems to answer this criticism about relapses. He found that, despite relapses, his insulin-treated group had enjoyed 251 years of health out of a possible 564 years. The untreated control group had only enjoyed a mere 78 years of health out of a possible 551.

This relapse rate and the failure of some patients to respond to insulin makes us realize, however, that this treatment is not the final answer to the therapy of schizophrenia. Complacency

with our present results must be avoided at all costs, and we must continue our search for better ways of helping these patients.

I am glad to have found myself so much in agreement with what Dr. Freudenberg has said. But, as he pointed out, disagreements about the value and limitations of insulin treatment are not now very marked among those who have themselves actually worked for long periods on this specialized treatment. It has always seemed to me that those who are still over-enthusiastic, or more commonly too full of doubt and caution, are generally those who hold such views without adequate personal long-term treatment experience of their own. I think that one of the results of this paper and the discussion to-day will be to find that there is now a fair measure of agreement among insulin therapists on what can, and what cannot, be expected of the treatment. If this proves to be the case, our next step is to see that it is made more readily available to all those who would benefit from it.

Dr. JOYCE SMITH (St. Ebba's Hospital) said: I should like to thank Dr. Freudenberg for his extremely interesting and enlightened paper. I feel that as a pioneer of insulin treatment he speaks with real authority. My own experience with insulin is more limited, but the results bear out much of what Dr. Freudenberg and Dr. Sargant have said.

As Dr. Freudenberg has stressed, the difficulty of assessing the value of insulin therapy in schizophrenics lies in the variety of techniques and of diagnostic criteria as to what is a schizophrenic, but as he says, these can largely be overcome if observation and treatment are carried out by a single doctor. For this reason I should like to quote my own observations. All the cases were admitted to St. Ebba's Hospital and all are females between the ages of 14 and 35, so that they mainly fall into Penrose's age-groups for schizophrenics. The diagnosis of schizophrenia was in all cases agreed by at least two authorities.

The number of cases treated was 119. Of these, 101 have been discharged (85 per cent.), and of these 101, 21 have relapsed and have been readmitted to hospitals, leaving 67 per cent. discharged at the end of four years. The total average length of time in hospital was 24 weeks; the average time after starting treatment was 16 weeks.

Of 52 comparable cases taken before insulin treatment was started, 25 were discharged (48 per cent.), and of these four are known to have relapsed and to be again in hospital, but no systematic follow-up has been possible. The average length of time in hospital was 36 weeks.

Technique.—I most heartily agree that the value of insulin treatment to a large extent depends on the technique. Patients must have a definite coma. In my opinion, sub-coma doses in schizophrenics are of no real benefit. The patient's physical state may improve, and if anxiety happens to be a prominent feature that may be ameliorated, but the underlying schizophrenia is untouched. Several of our patients have had sub-coma insulin, with no benefit in their mental state. One particularly striking case was a girl of 18 who had 70 units of insulin daily for seven weeks; there was no coma and no improvement. She was then given 20 comas (coma dose 90 units), and was discharged six weeks after starting treatment. That was four years ago, and she has since trained as an engineer and has now married.

One necessary factor then is to induce a satisfactory coma. I usually give half-an-hour in coma, but one may need to vary it with each patient. Some do better with a very deep coma for ten minutes.

The post-coma stage is a very important one. For a varying time after the coma, patients are in an uninhibited, more or less lucid state in which they talk of worries and difficulties, real or imagined, which they are unable or unwilling to express at other times; so that it is very important for the doctor and the staff to make use of this time to unravel difficulties and re-educate the patient in more normal ways of thought.

Separate ward.—I think the treatment gives most satisfactory results when there is a separate ward set apart for treatment, and several patients treated together. It seems to induce states of companionship, mild rivalry and mutual dependency, which are very helpful in re-educating the patient in more normal ways of thought and conduct. Occasionally, owing to staffing difficulties, we have had to treat a solitary case in the general ward, and they have taken much longer to become sociable and form interests and companions in the ward. A question which I find difficult to decide is whether male and female treatment centres should be entirely separate.

Insulin coma treatment alone is not enough. Each person has to be treated as an entity, their particular difficulties assessed, and their environment investigated and adjusted; for this reason, in addition to the doctor, it is necessary to have staff well trained in psychiatric work, an occupation officer and a social worker.

Follow-up.—To assess the value of treatment one also wants a systematic follow-up—this can only come with the passing years. Of our 101 discharged cases:

11 have been discharged and well over 4 years.

24 " " " 3 "

15 " " " 2 "

17 " " " 1 year.

11 " " " and well under 1 year.

2 alone cannot be traced. 21 have relapsed, as stated above.

In my experience the follow-up of insulin cases is comparatively easy. Patients take a real interest in co-operating with the doctor.

Number of comas.—The number of comas needed for each case is a controversial point. We began by giving 40–50 comas as a routine, but now give on an average 30–35, depending entirely on the improvement of the patient. On the whole, I think the patients who are going to respond to treatment give definite indication of this by the 25th coma, and then need a further 5–15 comas to stabilize them. I agree with Dr. Freudenberg that many patients respond much earlier than this, but have a tendency to relapse if treatment is discontinued too soon.

Convulsion treatment.—The question of E.C.T. prior to or in conjunction with insulin is interesting. Many of our patients have had treatment by E.C.T. prior to insulin; some showed improvement, but on the whole the schizophrenic symptoms had not benefited. E.C.T. was found useful in conjunction with insulin in four types of cases:

(1) At the end of insulin treatment where the patient, although otherwise normal, was fearful of facing responsibilities and lacking in self-reliance. The E.C.T. produced an alertness and urge to cope with reality which was very striking.

(2) Those in whom improvement was stationary over several comas.

(3) Those who had difficulty in facing reality were retarded, wrapped up in fantasy, and difficult to get at, even in the post-coma stage. In these an electrically induced fit at the end of 30 minutes' coma produced very good results.

(4) Where there is marked resistance to insulin.

Complications and contra-indications.—I agree with Dr. Freudenberg as regards complications and contra-indications. The treatment is a severe one for patients and staff, but to get the best results all must be courageous. Our most troublesome difficulties, and they were far from common, were:

(1) Persistent pyrexia, apparently due to the insulin. Patients would run temperatures of 100°–103° for several days, settling and then recurring as soon as insulin was restarted.

(2) Series of spontaneous seizures. These occurred in two cases, and lasted for 48 hours. They responded to luminal and lumbar puncture, and the patient apparently benefited from the seizures.

(3) Prolonged coma. We have had only one case who remained comatose for four hours. She was considerably benefited.

It seems that the chief thing is to push on with insulin as long as the patient remains physically fit. Among our 119 cases were two pregnant patients, one 10 weeks, the other 14 weeks at the time of starting treatment. In neither case did the pregnancy suffer. The patients were discharged, went on to term, had live children and no further recurrence of mental trouble. Both children are perfectly normal, one a girl nearly 3, the other a boy now 3½.

Age of patients.—Dr. Freudenberg raises the point that patients under 15 do not do well with insulin treatment. So far our experience, although small, does not bear this out. We have treated three young girls of 14 years. One has been discharged over four years, is leading a normal and useful life, earning her living, and is now engaged to be married. Another has only been discharged six months, but is earning her living and better than she has ever been. A third has only recently been discharged.

Prognosis.—I agree with Dr. Freudenberg entirely as to the type of case that benefits, but one does occasionally get startling unexpected results; so that, ideally, till insulin coma therapy is supplanted by a more useful treatment, each case should be given a course of treatment. The cases which respond least well are those with very marked thought disorder in a clear consciousness and with little emotional upset.

The 21 cases that relapsed may be divided into three groups:

Group 1.—10 relapsed in the first year and were more or less predictable. On the whole, the results with second course of therapy have been discouraging.

Group 2.—7 relapsed over a year, and under two years after discharge—in the majority of these there was very definite stress, and on the whole they were better adjusted personalities than patients in Group 1.

Group 3.—4 relapsed two years after discharge. Again rather poor personalities who one rather expected to break down.

Of the relapsed cases, 50 per cent. were those who had a history of over one year or a history of a previous attack.

Dr. Freudenberg mentions leucotomy after insulin therapy. Among our treated cases four have subsequently had a leucotomy, namely one of our own undischarged cases, and three of the discharged relapsed cases. None of them have benefited from the operation.

I think insulin therapy is definitely beneficial in the treatment of schizophrenia, that the length of time in hospital is reduced, and that more patients can be returned to a useful life with the treatment, but that these things can only be brought about if a proper technique is followed and the whole personality and environment of the patient is studied.

Dr. W. MAYER-GROSS said: I propose to report on the results of a follow-up, over three years, of patients treated with insulin coma therapy at the Crichton Royal. The number of cases so treated until October, 1946, is 518. While we were fortunate in being able to continue the treatment throughout the war, our follow-up studies have suffered from lack of social workers

during the last two years. Hence the relatively small numbers of patients in the follow-up series. The follow-up studies have now been resumed and the results now are, as far as one can judge, if anything slightly more favourable.

Table I refers to 50 patients treated in 1940/41. They are compared with a control material collected by E. Guttman, E. Slater and myself and published in 1938. It was then evident that the newly introduced physical methods could only be evaluated if comparative figures on the course of the disease without active treatment were available. Statistics published by Max Mueller (Muensingen) and others had already at this time proved that schizophrenia responded to insulin therapy only in its early stages, and that results became doubtful when the illness had lasted more than 18 months. Realizing the fallacy of claiming success in a disease which tends to remit spontaneously in its early stages, we tried to provide a series of controls of early schizophrenia with the best possible prognosis. Any treatment offering better results would be definitely justified.

TABLE I.—50 Early Schizophrenics, ill one year or less, Treated with Insulin, Crichton Royal, compared with 188 Early Schizophrenics, of same duration, Not Treated, Maudsley Hospital (in brackets).

	Number.	Per cent.
Hospital invalids	15 (77)	30 (41)
Family invalids	2 (18)	4 (10)
Social defects outside hospital	3 (15)	6 (8)
Total and social recoveries	27 (67)	54 (34)
Dead	1 (7)	2 (4)
Untraced	2 (4)	4 (2)

$$\chi^2 = 6.22$$

$$P < 0.02$$

From the total of schizophrenics discharged from the Maudsley Hospital in 1934/35 all patients were excluded whose illness ante-dated admission more than one year, all cases over the age of 45, and finally all those in whom there was any doubt or difference of opinion among the three workers as to the diagnosis of schizophrenia.

Another selection was given by the rule that the Maudsley Hospital only admits voluntary patients who *prima facie* have a favourable outlook. 188 patients thus found were, as far as they were not in mental hospitals, followed up by personal visits.

Among the first 112 patients treated by insulin coma at the Crichton Royal, 50 fulfilled the criteria of the Maudsley group as to diagnosis, duration of illness and age.

As can be seen from Table I, the percentage of recoveries among the treated patients is 54 against 34 in the non-treated sample while the number of invalids is reduced to 34 against 51. The differences are statistically significant. The result is more impressive if one takes into account the type of patient generally admitted into a remote mental hospital compared with the admissions to a centrally situated place like the Maudsley Hospital.

Table II gives a comparison between the two series of patients in respect to their stay in hospital during the three years of the follow-up period, indicating the statistical significance of differences. At the 6th, 9th, 30th and 36th month a significantly smaller number of treated patients was in hospital than of those not treated by physical methods. Graph 1 compares the two series in curves showing the number of patients discharged from hospital and illustrates the saving of hospital beds through insulin treatment.

It has been stated that insulin therapy, though effecting an immediate improvement, leads to a greater number of relapses. The last column of Table II shows that there is, in fact, no difference in the relapse rates of the two series. However, the numbers of relapses are rather small for a safe comparison on this point.

Critics, although accepting these numerical results, have found them relatively modest if compared with reports of early enthusiasts, and not worth while the trouble and expense of treatment by hypoglycaemia and its dangers for the patient. The answer is that, at present, no other method furnishes similar results. Neither long series of E.C.T. nor their combination with "modified" insulin or thyroid medication gives, in our experience, a comparable number of reliable remissions. It has to be remembered that the accumulation of chronic schizophrenics in mental hospitals is one of the great and urgent problems of present-day psychiatry everywhere. By taking up the hospital beds they block the admissions of early cases, thus obstructing, as in a vicious circle, preventive and therapeutic activities of the hospital staff.

What cannot be illustrated by statistics is the better quality of remissions after insulin treatment. The lively affective response, the spontaneous and active interest in the people around them and in their own future regained by the patients during the treatment cannot be measured. Everybody who practises insulin therapy and remembers what spontaneous remissions in schizophrenics were like before is impressed by this qualitative difference. One can easily understand that under this impression some workers regarded hypoglycaemia as the specific therapy of schizophrenia, which it is certainly not.

It is, in my view, a crude attempt at influencing the disturbed cerebral function. Although purely empirical and originally based on naive and obsolete theories, it attacks what during the last decade has been established as of decisive importance in cerebral function—the carbohydrate metabolism of the cortical cell and of the central nervous system as a whole. It therefore may,

one day, be instrumental in solving the evasive problem of schizophrenia, which already Kraepelin had at one time classified as a metabolic illness.

I am indebted to Dr. Eliot and Dr. Patrick Slater for their assistance in the statistical evaluation of this material. My thanks are also due to Dr. P. K. McCowan, Physician Superintendent of Crichton Royal, for his permission to publish these observations.

REFERENCE.

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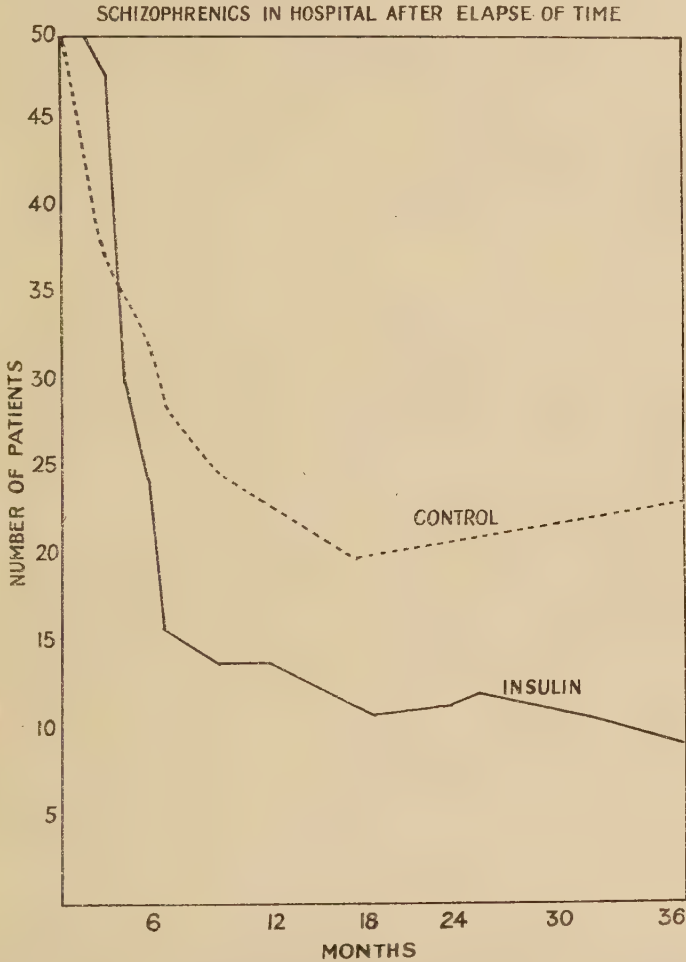


TABLE II.—Percentage of Patients still in Hospital and Percentage of Relapses in 50 Early Schizophrenics Treated with Insulin from Crichton Royal, compared with 188 Early Schizophrenics Not so Treated from Maudsley Hospital (in brackets).

Number of months in hospital, dating from one month before treatment (from admission).	Still in hospital, per cent.	P.	Relapsed for first or subsequent time, per cent.
4	62 (68)	$> \cdot 30$	— (3)
5	48 (63·5)	$< \cdot 05$	2 (4)
6	30 (55·5)	$< \cdot 01$	2 (2·5)
9	20 (45·5)	$< \cdot 01$	8 (4·5)
12	16 (39)	$< \cdot 05$	12 (7)
18	12 (32·5)	$< \cdot 05$	10 (7·5)
24	12 (32)	$< \cdot 05$	12 (9·5)
30	10 (32)	$< \cdot 01$	12 (12·5)
36	8 (31·5)	$< \cdot 01$	10 (14)

Dr. J. BIERER wished to bring forward two points which appeared to be of importance. First there was the question of diagnosis, and he would remind members of Langfeldt's brochure in which he differentiated schizophrenic states from the true schizophrenic process, and stated that in his opinion these schizophrenic states would in nearly 100 per cent. of cases recover without treatment. He would mention also Klaesi's paper from Switzerland, in which he stated that he had 60 per cent. of social recoveries with occupational therapy alone. It appeared therefore that it should be considered whether effort should not be concentrated on getting a clearer idea of diagnosis.

Secondly, from a research point of view, it would be more fair if instead of taking a control group of untreated patients one took, on the one hand, patients who were treated only with insulin without any psycho-therapeutic methods, and, on the other hand, a group treated with all other modern methods, including psycho-therapy. Two or three other methods could be taken into account—insulin treatment with psycho-therapy, or partial psycho-therapy—or not treated at all, but as long as the specific influence of insulin was not known it was the psychiatrist's duty to do this.

Insulin had been used for schizophrenia for 13 or 14 years, and as far as he knew the literature the percentage of recoveries varied between 25 per cent. and the famous 87 per cent. of Sakel. Since so many different results were reported, they should try to develop a system in one big centre where there were enough patients to be able to have these different forms of control. So long as there was not some such system as this he wondered whether they could come to any real conclusions.

Dr. McINNES said that there was one question he would like to ask which had been stressed by two of the speakers—that generally speaking the insulin patients did better when treated in groups. This raised an interesting question in the discussion on group therapy and its possible relation to insulin treatment. Before putting his question to the speakers he would like to speculate on possible reasons why insulin patients did best in groups (if that were the case). It might simply be that the common association with the doctor and the nurses in the group was beneficial to the withdrawn schizophrenic types. The activities that went on in the insulin room and subsequently, especially if the group was kept together, might be of such a socializing nature as to stimulate the patients to greater contacts, to fortify their ego in such a way that they could bear the frustrations and disappointments which were inseparable from living together without breaking down or withdrawing further into their schizophrenic fastness.

These obvious things might be at work, but he also wondered whether a deeper influence was at work. It might be that the sharing of a proven biological danger might be an operative factor. There could be no doubt that however else treatment might be regarded by the patient, he must regard it at least as a profoundly dangerous undertaking to be rendered comatose five or six days out of the week for a period of six or more weeks. This was an experience which, however well it could be borne at the conscious level, could not but stimulate the most profound fears at deeper levels. It was possible that this might be a deep dynamic factor operative in creating a common group feeling, and consequently create perhaps in a rather roundabout way a possible therapeutic help.

He would like to ask the speakers whether in their opinion there was anything positive to be gained by treating insulin patients in groups; whether any of the remarks he had made were at all apposite. If that was so, had any work been done to discover whether there was a difference in the results, either numerically or qualitatively, as between the insulin patients treated singly or in twos and threes or where they were treated in groups of a dozen or more by contrast?

Dr. URSULA HICKMAN, on the subject of patients being treated in groups, said that about a year ago it had been found at Warlingham that the insulin group was getting large and unwieldy, and it was decided to split the group, keeping the more chronic patients in a unit in the main hospital, while at the same time a smaller group of mild and early cases was put in a convalescent villa. The facilities were in favour of the smaller group, the nursing and medical staff were chosen so that there was equal experience, but it was found almost at once that the progress of both groups deteriorated, and this was particularly noticeable in the smaller group of milder cases. After quite a lot of consideration the groups had to be reunited, and immediately the results improved. The insulin patients were now kept together, they were treated as a family, the nurses were not changed very often, and they were responsible for their own patients throughout the day. The patients might have to sleep in different wards, but the particular insulin nurses were responsible for their patients not only when the treatment was being given, but for their entertainment, walks, and generally supervising them throughout the day.

In the matter of combined treatment they had also had rather interesting results. Some time ago, owing to pressure, a certain number of schizophrenic patients were kept waiting for insulin treatment, and during that time they received electrical treatment. Many cases showed absolutely no improvement and then went on to insulin. A certain number showed no improvement after thirty comas. Then they received a combined treatment and a number immediately showed considerable improvement. There was, therefore, a use for combined treatment where there had been no improvement beforehand with either method separately.

She agreed with Dr. Smith that there were the four groups, particularly the first two, where the patient recovered from the acute symptoms but remained apathetic; such cases showed remarkable improvement with combined therapy. She would quote the case of a man with a five years' history admitted to her hospital. His relatives at first refused to consent to any form of treatment and then they consented to leucotomy only, and it was performed with quite considerable improvement. He could not be called recovered, however. Later the relatives at last consented to insulin treatment; he was given a full course of insulin and showed marked further improvement. He might be classed as a "family invalid" type although, as his family refused to have anything to do with him, he was still in the hospital.

Dr. SANDISON said that insulin therapy was started at Warlingham in 1938, and it was decided in 1940 to switch the technique to giving the insulin by the intravenous route followed by intravenous glucose, and later potato soup by the mouth. The hospital had been criticized on various grounds for this technique, and one of the grounds had been that recovery from the insulin coma was much more rapid when it was terminated by the intravenous glucose technique, therefore it was thought that the reintegration of the personality was not so effective. But a survey of the results of this treatment showed that 353 cases had been treated by the intravenous technique, 61 of which were more than five years ago; and of these, 36, i.e., 60 per cent. had left the hospital and had not returned, except two who had relapsed and had been in other mental hospitals. Of the remainder four died from other causes, one was a suicide, and the remainder were at this moment in his hospital, although five cases had had remissions and had been home for some varying period during the five years. Of the 36 cases which were now out, five had received leucotomy as well, enabling them to complete their social remission following insulin treatment, so that it was not quite fair to attribute the results entirely to insulin. He did feel, however, that the results obtained by this technique compared favourably with other techniques. One of the advantages was that after-shocks were practically unknown, and the majority of the male patients were quite capable of playing football in the afternoon after treatment in the morning. Only one case of after-shock following this exertion had actually occurred.

He would like to draw attention to these figures, which he felt compared favourably with those brought forward earlier in the discussion.

The PRESIDENT said that this problem had been one of intense interest, and one in which a good many had had considerable experience. At Morningside insulin treatment was commenced as early as 1936, and there was a very steady course of treatment with insulin therapy, which was later discarded. He supposed it was a reflection on his own attitude, and was an indication that he had been dissatisfied, taking it all through, with the results accomplished. He had felt that with modified insulin, together with E.C.T., or cardiazol, and with individual care and looking after, the Morningside results in recent years had compared favourably with those they had in the years of insulin treatment when everybody was taking it up so enthusiastically. After this discussion and the presentation of the papers, which were most important and impressive and had covered a great deal of material, he thought it might be wise, now that they were back on a peace-time basis and one could begin to think in terms of staff and facilities for treatment, to reinstitute an insulin unit at his hospital.

The main problem was that which Dr. Bierer had mentioned, the question of diagnosis. The important thing was what one was going to call schizophrenia and what not. He often felt that diagnosis was poor. Many cases had a rapid diagnosis made as soon as they were admitted to a mental hospital, because it was felt that treatment should be instituted at once. This was a dangerous element in hospital administration; the patients and new admissions were not given sufficient time to make an adequate recovery. The diagnosis was made within the first two or three weeks; that was contrary to the experience of those who had worked in mental hospitals all their lives. It was a danger that there was this insistence on getting rapid results, doing something actively at once, not only to satisfy the doctors and the patients, but the relatives of the patients, who asked for something active to be done. This was the problem on which Dr. Bierer put his finger—what conditions were to be called schizophrenia, as distinct from atypical manic-depression. It was in the atypical cases in which Dr. Freudenberg had shown the best and most satisfactory results, and he thought that was because one was dealing with definite emotional disturbances which corresponded essentially to the cyclothymic rather than to the schizophrenic, and it was a question of differentiation between these groups. It was a problem of psychiatric treatment and psychiatric acumen which must be kept in the forefront before one began to tabulate too many results. It was a good thing to have the problem brought to the Association and presented in such an able manner. He might be a little conservative and a little antagonistic to this, but at the same time he did feel that he must try to keep an open mind in regard to it and to study these papers and figures which had been presented with very great care.

Finally he would commend the question which Dr. McInnes raised so clearly and cogently. There was the question of treatment *en masse*, the contagious enthusiasm transmitted from doctor to nurse and to patient, which was a real psychological factor which would have to be assessed to a certain extent in addition to the actual physical treatment which was being carried out.

Dr. FREUDENBERG, in reply to Professor Henderson and Dr. Bierer with regard to diagnosis, said that he had read Langfeldt's book, and in fact diagnosed his patients largely on Langfeldt's criteria. In the final estimation all atypical cases were excluded from the series, and when this had been done, the results of treatment by insulin were still higher than in the control group.

With regard to the point whether insulin alone or environmental factors were of importance, of course it would be necessary to do more research from that point of view, and control and compare different groups who had insulin alone or psychotherapy alone or environmental influences. Some work of that kind had been done in America. Lipschutz and his co-workers studied several groups: one group treated with insulin alone; one group treated with insulin plus rehabilitation and occupational therapy; one with rehabilitation and occupational therapy only; one group had saline instead of insulin and had occupational therapy; one group had saline only; and one group had ordinary hospital care; it came out that the insulin-treated cases had the best results. The cases were, moreover, of over one year's duration of illness, so that the results were more reliable than with cases of shorter duration. It was evident that a study of that kind should be done on a larger scale.

PERSONALITY CHANGES AFTER LEUCOTOMY.

By E. L. HUTTON, M.B., B.S., D.P.M.,

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IN this paper are given the histories of ten patients who have been treated by means of leucotomy, particular attention being paid to the study of character and personality traits.

The records are compiled from the information given by a relative or relatives, supplemented in some cases by data supplied by the patient as well. This method undoubtedly has serious disadvantages, for the information must inevitably be dependent upon the informant's veracity, powers of observation and description, memory, and conscious and unconscious subjective bias. In every case the interview took place at the patient's home, so that the interviewer could obtain a personal impression of the patient's home environment. Furthermore, the information regarding the pre-morbid personality was only obtained after the illness, operation, and recovery, and in some cases it was difficult to ascertain when the morbid changes actually began.

In this investigation, which was carried out between August and November, 1945, particular importance has been given to the pre-morbid personality, for it is felt that the evaluation of Moniz' operation must not only be based on the amount of improvement following it, but on the nature and degree of the changes between the pre-morbid and post-leucotomy personalities. It must, however, be borne in mind that some of these changes may be attributable to the illness itself rather than to the operation.

Of these ten cases, six had been certified and had been in a mental hospital for periods varying from two to six years. Of the others, B. Y— had been for many years extremely trying for her family and very miserable herself. The others, G. H. D—, G. R— and S. A— had all had periods in a mental hospital as voluntary patients, and would finally have had to be admitted to a mental hospital. In all these cases the prognosis, apart from operation, was bad.

These ten cases show considerable variations in age, social status, education and occupation, as well as in intellectual ability and temperament. Nevertheless there are certain features which they all seem to manifest in greater or lesser degree in their pre-morbid personality, and which seem to have disappeared after leucotomy.

The most outstanding feature is self-consciousness. In different ways, according to their temperament and circumstances, these people seem to have been abnormally aware of themselves. In the majority of them this self-consciousness was accompanied by shyness and reserve, and in some by

definite feelings of inferiority. In one or two cases this preoccupation with the self was undoubtedly increased by the critical and rather derogatory attitude adopted by the patients' parents (B. H— and F. H. D—).

Coupled with this self-consciousness there is a lack of social adaptation and a restriction of personal relationships. With one exception (R. J—) none of these patients made friends easily, though in some cases they showed considerable attachment to their family or to one or two particular friends. Some of the patients in this series seem to have been keenly aware of their social deficiencies, and to have been emotionally disturbed by them; while others seem to have rather prided themselves on "keeping themselves to themselves."

The majority of these cases are reported to have been conscientious and meticulous, some of them excessively so, with a definitely religious outlook, though the basis for this seems frequently to have been merely the adoption of the religious views of their environment.

In spite of their egocentricity and their preoccupation with themselves, many of them had genuine affection and sympathy for others, and were not intentionally egoistic, even when making exorbitant demands on their environment.

During their illness the egocentricity and preoccupation with themselves and their own affairs became enormously increased. It is perhaps worth quoting here Ibsen's description of the inmates of the asylum in *Peer Gynt*:

"Beside themselves? Oh no, you're wrong!
It's here that men are most themselves—
Themselves and nothing but themselves—
Sailing with outspread sails of self,
Each shuts himself in a cask of self,
The cask stopped with a bung of self
And seasoned in a well of self.
None has a tear for other's woes
Or cares what any other thinks."

As Fosdick says: "All the way from social embarrassment to insanity, egocentricity is ruinous to real personality."

Four of these patients became catatonic schizophrenics, entirely withdrawn from the external world; two became almost completely absorbed in their own physical symptoms, one originally developed delusions of persecution before becoming an agitated melancholic, and the remaining three were depressed with feelings of inferiority and self-reproach.

When we come to study the post-leucotomy personality, there seems to be a very obvious diminution of self-consciousness which shows itself in different ways. There is less shyness and reserve, so that there is no embarrassment on meeting strangers or casual acquaintances; there is more indifference to adverse criticism, and considerably less preoccupation with bodily functions. In a few cases the patient, after the operation, gives the impression of being smug and self-satisfied.

Accompanying this loss of self-consciousness there is also a decreased awareness of the feelings of other people. Some of these patients have become noticeably tactless, apparently neither observing nor caring about the effect of

their remarks upon their hearers ; S. A— has even become openly rude and offensive. There is also a shallowness in their emotional life, none of them have shown any tendency to make new friends, and in some cases the relatives complain of a definite absence of their old affection. This was particularly noted in the case of E. J—, B. Y— and G. R—. Thus the sister of R. J— says that whereas before he was genuinely thoughtful and kind towards his family, he now seems insincere in his dealings with them, and the husband of B. Y— thinks that she would not now be unduly upset if he died. The improvement in the attitude of L— to her daughter also seems to be due to a relative emotional indifference rather than to any real loving devotion to her daughter's interests. In fact, the general tendency in the post-leucotomy phase is for an increased self-indulgence and egoism, the patient unconcernedly living his own life and attending to his own needs, but at the same time taking a greater interest than hitherto in the environment and having a rather wider range of interests. Where the dynamic drive is not very strong, as in the case of the elderly patient G. R—, there is a restriction of activity due to inertia, and a willingness just to sit, though even he reads more and listens to the wireless more than he did, but with less discrimination.

In the case of G. R— and E. J—, this emotional indifference prompted the relatives to use almost identical language in describing them. The wife of G. R— said "His soul appears to be destroyed, he is not the man I once knew," and the sister of E. J— remarked "He is without soul now," and asserted that whereas before they could always appeal to his better self, now he seemed to have no better self to which to appeal. G. R— also sees no reason why he should make himself do things he does not want to do.

In some of the other patients a change has been noted in the moral aspect of their character, and in most the change is for the worse ; they tend to be less truthful, less reliable and less scrupulous than they were in their pre-morbid days. Allied to this there is a definite reduction of the interest taken in religion, and one or two are quite outspoken about it, J. B— remarking that she does not believe in all that rot !

There is, however, no evidence of any increased anti-social activity or immoral behaviour, and if there is some diminution of virtue, there is no corresponding increase of vice. In none of these patients has there been observed any indulgence in sexual excess, but in some cases the marital relationship has become somewhat more normal.

Intelligence certainly seems to remain unimpaired, and where the physical drive is adequate they seem to be as successful in their work as they were in the pre-morbid days, in some cases even a little more so. The sense of personal responsibility is somewhat reduced, and worry and anxiety about the future rarely occurs, though they react normally to immediate situations.

CASE I.—J. B—, female. Year of birth : 1919. Diagnosis : Catatonic schizophrenia. Date of leucotomy : 16.i.42.

Pre-morbid personality.—Good home, superior artisan type. Secondary school education ; school certificate. Subsequently did clerical work. Brought up in religious atmosphere ; used to attend church regularly. Very keen on Girl Guides and fond of games. Not very sociable ; had two special girl friends but no friends of the opposite sex, and seems to have been somewhat jealous of her free-and-easy, socially

popular sister. She was excessively conscientious, and took tremendous pains to do her schoolwork well and worried too much about it. She was extremely neat and painstaking, and used to chide the rest of the family for their lack of tidiness. Reliable, kind and helpful in the home. Teetotaler, moderate smoker, no sexual experience. Shy, reserved, self-conscious, inclined to worry and anxiety, with feelings of inferiority.

Morbid personality.—Admitted to mental hospital from March–October, 1934; from April, 1937, to March, 1938; from June, 1938, to July, 1940. Finally readmitted in November, 1940. On this occasion admitted being jealous of her sister. In conversation was silly and disconnected. She was mischievous and interfering, noisy, restless, difficult, unemployable, solitary, and would not wash or dress without prompting. A course of E.C.T. in November, 1940, produced some improvement, but she quickly relapsed, and by October, 1941, was mute, catatonic, and semistuporose.

16.1.42: Leucotomy. Discharged. Was reported to be rather awkward with strangers, not very sociable and jealous. Rather slow and not very competent.

Post-leucotomy personality.—Considerable improvement. Since her discharge has taken an examination in typing and passed it, and has been working as a typist for over a year; likes it quite well, but is slightly worried by the noise of the machines. Still goes to church occasionally, but now says she does not believe in "all that rot." Takes no part in any sport, and has not resumed her old interest in the Guides. Seems more self-centred. Has one girl-friend with whom she goes out occasionally, but does not seek outside friendships or company. No evidence of any sexual libido. A little domineering with her sisters. Does not worry so much about the tidiness of her room, though still keeps it in good order. Tactlessness an outstanding feature; whereas previously she would always think twice before speaking, now she says what she thinks and makes the most tactless remarks without seeming to notice or care. Has ceased to worry and shows no anxiety, but occasionally seems to reproach herself, saying she has brought trouble and disgrace on the family.

Summary.—This patient's illness supervened before she had achieved a mature personality—while she was still in the adolescent phase. Of rather above average intelligence, her main interests were those of the schoolgirl, and she had evinced no overt interest in the opposite sex. (No information is available *re* masturbation.) Brought up in a church-going atmosphere, she seems to have been extremely conscientious and with a strong sense of responsibility, coupled with a painful awareness of her own shortcomings and jealousy of her sister, which gradually led her to retreat from the harsh world of reality to the inner life of the schizophrenic.

Following the operation she is now capable of living at home and has again become a wage-earning citizen, but is more self-centred than she was, and less considerate of other people. Tactlessness has become an outstanding characteristic, and seems to be allied with an indifference to other people's feelings. She also appears rather self-satisfied, and has no desire to make new friends, resume her old interests or take up new ones. She is still tidy, but the excessive meticulousness has disappeared, and she evinces no worry or anxiety. Although she still conforms occasionally to the church-going habits of her home, this is no longer from any inner conviction, for she now says that she does not believe in any of that rot.

CASE 2.—F. H. D—, male. Year of birth: 1916. Diagnosis: Hypochondriasis. Date of leucotomy: October, 1943.

Pre-morbid personality.—Only child of elderly parents. Father neurotic since the last war; very contemptuous of patient; repeatedly accused him of being no good. Father said to have been clever, and patient admired him but was afraid of him. Mother reputedly fond of patient, but much influenced by her husband, and a rather fussy, excitable type; both parents of French extraction. Good education: Clifton College; Oxford, two years; did not take a degree. Worked with London Transport and then went into the Army, 1939. At home, always quite friendly, generous and affectionate, fairly considerate and sympathetic, but very shy, reserved, obstinate, rather egoistic, suspicious and mistrustful. Moderately ambitious but rather lazy, and always faddy about his food and possessions. Serious-minded and "very gentlemanly." Fairly conscientious, truthful, religious, worrying, anxious, inclined to self-pity and with definite feelings of inferiority. Took a moderate interest in sport; connected with the Fighting French organization.

Some masturbation; libido said to be deficient, but had some hetero-sexual experience. Had several women among his friends, but there was never any emotional attachment on his part.

Morbid personality.—1940: Began to complain of abdominal symptoms; sent to General E.M.S. Hospital, then to E.M.S. Neuro-psychiatric Hospital. Invalided out of the Army. Had been thoroughly investigated by a large number of doctors. Complained continually of digestive disturbances and constipation; completely absorbed by his symptoms. Admitted on four separate occasions to a private mental hospital as a V.P. Was given three E.C.T., but was a very difficult patient, continually complaining, and treatment was discontinued. On the fourth occasion was admitted in July, 1943, leucotomy performed in October, 1943, and patient discharged two weeks later.

10.v.44: Apparently had a severe major fit.

Post-leucotomy personality.—Very considerable improvement. Got a job as French master in a prep. school; was there for one term, and then got his present job as French master in a co-ed. school. Married, March, 1946, to a French girl—a distant relative whom he met only a few months ago. Studying for a degree. Gets on better with both parents, *because now he does not mind anything his father says*. He is more self-satisfied, and is neither shy, reserved, nor self-conscious. His feelings of inferiority have lessened considerably, and he appears more ambitious and persistent. He has become rather placid, and a little absent-minded, but whereas before he was very self-absorbed and spent most of his time day-dreaming, he now lives right in the present. He is less lazy and apathetic, more independent and critical, less religious, but more truthful, and far less given to worry and anxiety. His excessive preoccupation with his bodily functions is markedly decreased.

Comment.—Both hereditary and environmental factors seem to have played a part in the production of this patient's illness. The derogatory attitude adopted by his neurotic father, coupled with his own shyness and reserve and a lack of real force of character, made him become increasingly preoccupied with himself, until ultimately his bodily functions became almost his sole interest. He was very sensitive to other people's opinions, and keenly aware of his own deficiencies and inferiorities, and compensated for these by withdrawing more and more from active life into one of phantasy, whence the impression that he was lazy. He was egocentric, though fairly conscientious, truthful and religious.

Since the operation he has become much less self-conscious, being no longer hurt by his father's criticisms of him, and his behaviour at home is more satisfactory. His excessive interest in himself has been replaced by renewed interest in work and finally in marriage. Freed from the paralysing effects of his own sense of inferiority, he now appears less lazy and apathetic, more independent, even more truthful and definitely more self-satisfied, though less interested in religion than before.

CASE 3.—V. B—, female. Year of birth: 1909. Diagnosis: Schizophrenia. Date of leucotomy: 9.xii.41.

Pre-morbid personality.—Devoted parents and on good terms with her sister. Elementary school education, then typist. Fair number of social activities; belonged to tennis, hockey and swimming clubs. Many women friends, but no other boy friend than her husband, to whom she was engaged for nine years and whom she married in 1935. No children, and relationship with husband seems to have been unsatisfactory. She was not very passionate, and coitus was infrequent, but she became very upset by her husband's growing indifference and suspected he was in love with someone else. Abstainer, moderate smoker, rather shy and reserved, but placid, good-tempered, friendly, kind, considerate and tolerant. She was conscientious, meticulous and very religious, worrying, anxious and apprehensive.

Morbid personality.—Became more and more preoccupied with her own worries. Admitted to mental hospital 26.iv.37–8.i.38.

27.xi.39: Readmitted. Talked continually of her own miseries and troubles, and blamed her husband for everything. She became very resentful and suspicious, and was finally asocial, exclusive and very unstable.

13.xii.41: Leucotomy.

7.ix.42: Discharged.

Post-leucotomy personality.—Since her discharge has lived at home with her parents and is separated from her husband. Got a job as a typist, but complained of her head and shoulder aching, and gave it up after two months. Since has helped with the housework and the family grocery business. Her old friends have moved away and she makes no effort to make new ones, and does not seem to be very upset by her husband's desertion. Does not worry like she used to do, but very occasionally seems a little apprehensive about what will happen to her when her parents are gone, and does not want people to find out about the mental hospital or about her husband. She is not so religious as she was.

Summary.—This girl came from a sheltered home, in conventional suburban surroundings, with the education, occupation, social activities, moral and religious outlook of her environment. She was of the worrying, conscientious, rather frigid type, and this probably was a far from negligible factor in the marital friction which arose. Her growing suspicion of her husband's fidelity and the unhappiness resulting therefrom finally assumed such proportions that she became psychotic. Since the operation she has successfully readjusted herself to the sheltered home environment, and seems very content with the ordinary everyday routine. She is more self-contained, and makes little or no effort to make friends, nor is there any strong sexual urge, nor any real concern over her husband's defection and the loss of her marital status. She is reported to be less religious than she was.

CASE 4.—H. L.—, female. Year of birth: 1884. Diagnosis: Melancholia with persecution delusions. Date of leucotomy: 26.i.43.

Pre-morbid personality.—Elementary school education, then children's nurse until she married, 1907. Husband in the Police Force. Very fond of her home, had few interests outside it and did not make friends. Very fussy and meticulous over her house and garden. Husband died of G.P.I. about 22 years ago. Patient had a breakdown following this and an early menopause at the age of 35. Following her husband's death she centred all her interest and emotions on her only child, and became exceedingly possessive; wanted to know everything her daughter did, invariably accompanying her everywhere. She was very quiet and reserved, but ambitious and determined, kind and affectionate, but very domineering to her daughter. She was conscientious, meticulous, truthful and religious, worrying and anxious.

Morbid personality.—Her illness seems to date from the time when a bomb exploded near her in April, 1941. She turned against her daughter, whom she had previously idolized, and accused her of stealing and of being in with a gang of thieves, and finally attacked her. She became depressed and unable to concentrate. She was admitted to a private mental hospital as a V.P., and transferred to a municipal one in December, 1941, and was finally certified. On admission she was still voicing ideas of persecution; she was being watched by the police; her daughter robs her and is immoral. Later she became agitated and developed ideas that her daughter had been murdered, and finally became more agitated, waving her arms in despair and accusing herself of being a wicked woman.

26.i.43: Leucotomy.

1.vii.44: Discharged.

Post-leucotomy personality.—Since discharge has again lived with her daughter, who is a school-teacher, but no longer clings to her or tries to rule her and dominate her. This naturally makes life very much easier for the daughter. She is amiable when she meets people, but does not seek friends. Her former gardening activities have not been resumed, she says because she must not work hard like that. She is neither very ambitious nor determined, nor as proud as she was. She is still quiet and rather reserved, but a little more impulsive than before. She is less interested in religion.

Summary.—A woman of average ability, whose range of interests was largely restricted to her own home. She was deeply attached to her husband and daughter, but the latter seems to have been subordinated to the mother's ego and was treated as a projection of it and not allowed to have a life of her own. (It is possible that the husband was treated in the same way, but there is no information on this point.) The patient's ego-ideal (including her ideal for her house and daughter) was fairly high, and she exerted considerable energy in trying to achieve the standard she

had set herself. Engrossed in her own affairs, she seems to have had little interest in other people or events. Her equilibrium was first disturbed by her husband's death, and later by the bombing. During her second breakdown she turned against her daughter, whom she had previously idolized, and developed delusions of persecution. (These may, perhaps, have had their foundation in the daughter's natural reaction against her mother's excessive domination.) These were later replaced by delusions that her daughter had been murdered, and she became very agitated and self-reproachful, accusing herself of being a wicked woman, and evincing strong feelings of guilt. After the operation this agitation and sense of guilt disappeared. Her daughter finds her much easier and pleasanter because of the diminution of the patient's ambition, domination and possessiveness, which seems to have been replaced by a much more contented acceptance of life as it comes. She is less religious than formerly.

CASE 5.—B. H—, female. Year of birth: 1914. Diagnosis: Schizophrenia. Date of leucotomy: 11.xii.40.

Pre-morbid personality.—Home relationships not very satisfactory. Father a parson (C. of E.), and parental outlook rather narrow and repressive. Much less intelligent and more difficult than her three brothers, of whom she was jealous and whom she exasperated at times by her behaviour. School record suggests that she was rather below average intelligence. Had very little contact with father, and extremely attached to mother, though at times showing great antagonism to her. Tried nursing in a children's hospital, but is said to have been very upset by some real or imagined advances by the night-porter. Stayed at home and helped in the house. Her natural interest in poetry and music was discouraged by her parents, and they were disappointed because she was slow in learning, inclined to be indolent, careless, unreliable. Worrying, anxious, and with feelings of inferiority, she was kind, affectionate, and demonstrative, but inclined to be jealous, envious, passionate and tactless, shy, reserved, self-conscious and egoistic. Very religious, eventually fanatically so, falling down in the road and calling upon God.

Morbid personality.—Onset of symptoms about 1936, finally necessitating certification and admission to mental hospital in same year; she became resistive, negativistic, destructive, and seemed continually in a state of morbid apprehension, frequently reiterating, "What am I to do?" During her stay in hospital, treated with insulin, hormone therapy and E.C.T. Had 77 treatments over a period of eleven months. Reacted well at first, becoming mentally stable for periods of 3-5 weeks. Later remissions lasted only a few days. During remission went home on leave, but shortly became unmanageable.

11.xii.40: Leucotomy.

15.ii.41: Discharged.

Post-leucotomy personality.—Since her discharge has had two simple jobs, first delivering papers, and secondly in a bakery, but this was not very successful. Much less difficult than she used to be, less bad-tempered and more affable, but not making any real friends. She gets on well with people and is no longer shy or self-conscious. Very attached to mother. No evidence of any sexual urge. A little inconsiderate (will sing a hymn tune over and over, ignoring requests to stop), and unreliable (will leave the job she is doing in order to sit down and read a book). Incontinence has been rather troublesome in this case, and she is rather self-indulgent, and inclined to eat other people's rations as well as her own if they are not locked away. No sign of worry or anxiety, and is less troubled by feelings of inferiority. Is now only moderately interested in religion.

Summary.—Severe emotional difficulties seem to have been occasioned in this girl, who was rather below average in intelligence, by the home atmosphere and the attitude shown to her by her parents. They seem to have had little insight into the nature of their daughter's difficulties, which were exaggerated by the narrow standards imposed and by the moral condemnation of her shortcomings. The mother's attitude to sex tends to be prudish and repressive, and the patient was probably very ill-prepared for the problems of adolescence. Unable to cope with her emotional difficulties, the patient developed an extreme religiosity which culminated in schizophrenia. Since her discharge she has readjusted herself to the home atmosphere, and seems quite contented with the narrow circle in which she lives. The father has retired and financial circumstances are rather straitened. Has

neither the intellectual ability nor the training for any sort of responsible job. She is affable and friendly, but does not seem to have any urge to make friends. She is happy, self-contained, less self-conscious and more indifferent to her mother's criticisms of her, and so more placid and not so difficult. She is definitely less interested in religion than before.

CASE 6.—S. A—, male. Year of birth: 1888. Diagnosis: Chronic melancholia. Date of leucotomy: 11.iv.44.

Pre-morbid personality.—Record of early life not very complete. Apparently came of middle-class family and had public school education, but never achieved any great success either there or in his later life. Was rather a rolling stone and went to America, but never settled anywhere for very long. Seems to have gradually come down in the world, and was finally working as a motor mechanic. Subject to recurring attacks of depression, the first occurring at the age of 18. Married in 1910 a woman whom he felt was socially and intellectually inferior to himself and who has gradually become very deaf, so that conversation with her is now very difficult. He had two children, boy and girl. The boy is said to have considerable musical ability, but there is much friction between them, and patient despises his son for turning from classical music to jazz. The daughter made an unsatisfactory marriage with a man much older than herself, and had a mental breakdown after the birth of her child. Many conflicting traits in patient's character. He was very slow, pleasure-loving, fond of spending, not very keen on work, but also religious, conscientious, dogmatic. Made very few friends but was attached to a Methodist parson, in whom he confided a great deal, probably because he was the only acquaintance he considered his intellectual equal. Proud, but with feelings of inferiority, of despair, self-pity and self-reproach, and inclined to worry and anxiety.

Morbid personality.—First attack of depression occurred at the age of 18 and lasted about 18 months. Second attack at 27 and was in mental hospital, U.S.A., for one year. Attacks have tended to recur about every ten years, lasting for varying but progressively increasing periods of time. Present attack began eight years ago.

1932: V.P. in mental hospital for short period. Continually complaining of depression; obsessed with the idea of death. Could not bear to be alone; could not do anything on his own. Troubled by insomnia. Had managed to keep at work most of the time, but was becoming progressively incapacitated by his symptoms.

Post-leucotomy personality.—Has had three jobs since operation, each a better job with more pay. Wife finds him more difficult. Quicker in his movements and seems to have more initiative. Is no longer shy and talks more easily to people, but does not seem to have made any special friends and keeps himself withdrawn from his work associates, considering them uncouth and ignorant. Now more bad-tempered, sarcastic, intolerant, quick to criticize, tactless and inconsiderate. Takes advantage of his wife's deafness and says rude, impossible things about her in front of other people. He is more self-satisfied and no longer has feelings of inferiority, nor does he show anxiety or remorse, though he himself feels unhappy over his isolation, which is aggravated by his wife's deafness, his daughter's illness and his disagreement with his son. Libido is normal and coitus with wife more frequent. His interests now are chiefly wireless programmes dealing with music or the theatre. Less concerned with his personal appearance, and careless about washing and shaving. Will not go to church now; says he doesn't believe in religion; doing Christian acts is his idea of religion, not going to church.

Summary.—The discrepancy between this patient's ideal of himself and the actual facts of his life seem to have played a determining part in his psychosis. Failure to achieve his standards resulted in hopeless brooding, depression and self-reproach, this depression being accentuated periodically, but becoming more and more persistent as time went on. He never seems to have had sufficient aptitude, initiative, determination or self-control to achieve success. Proud and self-absorbed, but far from self-satisfied. Since his operation he has become much more self-satisfied, but much more inconsiderate and outspoken about the environmental conditions in which he finds himself. At the same time he is actually slightly more successful in his work than before. He is less religious.

CASE 7.—Male, G. R.—. Year of birth : 1877. Diagnosis : Melancholia. Date of leucotomy : 3.xii.43.

Pre-morbid personality.—Elementary school education, subsequently shop assistant in gentlemen's outfitters. Army 1914–1918. On good terms with his family, and had many acquaintances of both sexes, but no very close friends, and married late in life, 1925. Happy, friendly, taking part in local activities, church, whist-drives, theatres. Very keen and industrious gardener. Conscientious, meticulous, scrupulous, fairly religious, affectionate, sympathetic and considerate, fairly quick-tempered and impulsive, and inclined to worry and with some feelings of inferiority.

Morbid personality.—In March, 1942, had a quarrel with his management, and had to give up the job which he had held for 18 years. This distressed him very much and although he got another job as a temporary Civil Service clerk, he felt he could not cope with it. By August, 1942, he was restless, eating and sleeping badly, was unable to concentrate and had lost interest in everything. In November, 1942, he was admitted to a private mental hospital as a V.P. for two months, and then was in an ordinary nursing home for four months. In November, 1943, a course of insulin sub-coma was tried, but with no improvement. E.C.T. was not considered advisable in view of his general condition.

3.xii.43 : Leucotomy.

17.xii.43 : Discharged ; there was already considerable improvement.

Post-leucotomy personality.—Has held no jobs since his operation, although attempts were made to persuade him to return to his old occupation ; but in view of the fact that patient has reached an age when the majority of people tend to retire his refusal to take up work again is not very significant. He is, however, unduly content to sit back and do little or nothing, and leaves almost all the responsibility of the home to his wife. If she tries to push him into doing something he becomes irritable, sees no reason why he should force himself into doing things, and just wants to be left alone. Less considerate and thoughtful, not helpful, and evinces very little real interest in anything. Pleasant and affable when he meets people, but shows no enthusiasm for going out for social evenings or meeting people, and does not spontaneously converse, though answers questions pleasantly and intelligently. Will go to the theatre with his wife, but makes no comments, and quickly seems to forget about it. Reads more and listens to the wireless more, but seems less critical and discriminating, listening to anything. Takes no interest in the house or garden now. Patient himself says he feels very well, is no longer nervous and does not get depressed, and is quite satisfied.

Summary.—Before his illness the patient seems to have been a respectable, conventional citizen, of average ability. Reliable and conscientious in his work, but with no outstanding ambitions, drive or initiative. He enjoyed his work as a shop assistant and worked for many years with the same firm. The same conventional moderation obtained outside his work. He had no obvious vices, and his virtues were of a somewhat passive nature ; friendly, with a large circle of acquaintances, but no very warm friendships ; affectionate but not very passionate. He did not marry until he was 47, and although a little frustrated by his wife's frigidity, he cheerfully accepted this and was not unduly upset by it. (Even before his illness it seems probable that his wife was the dominant partner.) His pleasures were very simple, his main hobby being his garden, and he took a moderate interest in religion and attended church. There was very little aggressiveness in his character, and when the break with his firm came he was unable to adopt a fighting role, and became overwhelmed by his difficulties, being unable to eat, sleep or concentrate properly, and becoming increasingly preoccupied with his own inadequacies—physical, mental and moral. Since the operation the lack of energy and absence of drive has become very pronounced, probably due in part to his age, and in part to a diminution of his sense of obligation. He sees no reason why he should bother himself to do things he doesn't want to do, and has become less conscientious, less meticulous, less scrupulous and less considerate than he was. His wife is finding it very difficult to readjust herself to this change, and she says that his soul appears to be destroyed, and that she feels he is not there as the man she once knew !

CASE 8.—R. J—, male. Year of birth : 1905. Diagnosis : Catatonic schizophrenia. Date of leucotomy : 19.xii.41.

Pre-morbid personality.—Secondary school education. Good school reports, but took no outside examination. Moderately athletic, indiscriminate reader and wireless listener; fond of music-halls, moderate drinker, heavy smoker. Family relationships satisfactory; got on quite well with parents and sister. Very sociable; many men friends and normal hetero-sexual interest in women. Married at the age of 28; seemed to get on fairly well with wife. Commercial traveller; worked for several firms, bettering himself on each occasion; final salary about £400 p.a. Always envious of people with money and planning to make a lot for himself, but was not thrifty, and when he got money would waste it on having a good time. Friendly and affectionate, but inclined to be tactless and domineering, and rather vain of his appearance. Moderately conscientious and truthful, but inclined to be impulsive and erratic, and so somewhat unreliable. Tended to have feelings of inferiority, and was apprehensive and inclined to worry. Was not interested in religion.

Morbid personality.—August, 1935, had a nervous breakdown when he attempted suicide by drowning in the bath at a London hotel. At the end of April, 1936, became wildly extravagant in his talk and behaviour. Suddenly bought a café, valued at £2,000, without having the money for it, but nevertheless managed to raise £1,000 towards it before going into hospital as a V.P. on July 10. He remained impulsive after admission, but gradually his conduct deteriorated and he became solitary, disorientated, mute and catatonic.

Leucotomy: 19.xii.41. Within a month of the operation he was conversing rationally, but remained idle and lacking in initiative. Showed little concern when told his wife was seeking a divorce.

Discharged: April, 1943.

Post-leucotomy personality.—Since his discharge has changed jobs two or three times; latterly employed as a clerk by the Admiralty. Inclined to be lazy; took this job because it was easy work and good pay. On good terms with his family, but with lack of any emotion. His wife has divorced him, but he does not seem to worry about it at all. Has a number of friends, but all people seem more or less alike to him and he feels little or no gratitude to those who have helped him. Now rather negligent of his appearance and even of personal cleanliness. Even more of a spendthrift than he was; while his money lasts goes to cinemas and music halls, but when it is gone is quite content to spend the rest of the week going to bed early and reading. Rather smug and self-satisfied, with no feelings of inferiority. Very self-indulgent, less conscientious, less truthful, more unreliable. Lies unconcernedly and does not mind if he is found out. Sister says that whereas before he was genuinely thoughtful and kind towards his family, he now seems insincere in his dealings with them. Before they could appeal to his better nature when they thought something should be attended to and he seemed reluctant to do it, but now he seems to have no better self to appeal to and can never be bothered.

Summary.—The patient seems to have had a divided personality long before the onset of the actual psychosis. On the one hand he appears extremely extraverted and with many external interests, but on the other hand his subjective introversive tendencies are revealed by his vanity, his feelings of inferiority and apprehension, his ambition and his envy of people with money. Finally he seems to have had a manic outburst, during which he entered into wild financial schemes, followed by a wave of depression and self-criticism, when he attempted to commit suicide. After admission to hospital his conduct remained impulsive for some time, but slowly lapsed into a mute, catatonic state. Following the operation intellectual recovery preceded volitional recovery, and for many months he remained contentedly idle. Since discharge he has again become a reasonably useful member of society, but is still rather idle and self-indulgent, lacking in responsibility, rather indifferent emotionally, and not very reliable. His extroverted traits remain, but his introverted ones have disappeared. He has never at any period of his life evinced any real interest in religion.

CASE 9.—B. D—, female. Year of birth: 1887. Diagnosis: Involutional melancholia. Date of leucotomy: 21.i.44.

Pre-morbid personality.—Elementary school education. Foster-mother at Cottage Homes 18 years. Family relationships said to have been quite good; one sister and large family of brothers. Little interest in opposite sex; one special

woman friend and many female acquaintances. Never joined any social club, mildly interested in fiction, wireless, cinemas and music halls. Quick-tempered and excitable; very generous, affectionate, fairly sympathetic, but rather spiteful. Shy, reserved, rather self-conscious. Found the boys in the Home rather difficult and unruly, but had a way which cowed most of them until her breakdown. Hated the family cat, and when in a temper would kick it or starve it. Was always worrying about religion; sister used to find her religion rather annoying; rather showy, she used to try and put everyone else right. Used to get on the family's nerves with her "musts" and her "oughts." Very intolerant of noise.

Morbid personality.—At the end of 1940 became progressively more depressed, lost interest, and wished to die. Her menstrual periods had stopped at the beginning of the year. She developed delusions of extreme wickedness, and when admitted to a mental hospital in April, 1941, was retarded, deeply depressed, self-reproachful, refusing food and unemployable. The depression could be terminated by short courses of E.C.T., but these were always followed by a relapse.

Leucotomy: 31.i.44.

Discharged: March, 1944.

Post-leucotomy personality.—Since her discharge lives with her sister and helps in the house, but indifferently and reluctantly. Is rather lazy and does not want to work; has no sense of responsibility or obligation to others, and resents it when her sister tries to make her do things, and says she is being bossed. Is now inclined to be sullen rather than quick-tempered, but on the whole is much more placid than she used to be, and any discord in the home now is caused by patient's lack of initiative and co-operation, and seeming disinterestedness. Is now rather self-indulgent, not always truthful, unreliable, artful and dishonest in small things, and is not so generous and affectionate. She is rather self-satisfied, and no longer shy and reserved. Less particular about her toilet and personal appearance. Has resumed her friendship with her woman friend, but has not made any new friends. Now makes a great fuss of the cat. Can stand any amount of noise. More outspoken, and less upset by what others say to her.

Summary.—A woman of average intelligence and limited education, with no outstanding abilities. She seems to have been rather a hard, somewhat bad-tempered woman, who was able to hold her job as Foster-mother at the Cottage Homes for many years, but who seems to have shown little real affection for or understanding of the children under her care. Her family evidently found her a little difficult at times. Shy and self-reserved, she seems to have had little interest in the opposite sex, limiting her friendships more or less to one woman friend and several women acquaintances. The psychosis was involutional and showed the typical symptomatology. Increasing preoccupation with herself led to loss of interest in external things, and to self-reproach and self-accusation with delusions of extreme wickedness. Since the operation she has become self-satisfied, less self-critical, a little less truthful and reliable, and more self-indulgent. There is also some lack of initiative and apparent laziness, together with lack of concern and consideration for others, but this is, on the whole, outweighed by her increased amiability.

CASE 10.—B. Y—, female. Year of birth: 1905. Diagnosis: Hypochondriasis and depression. Date of leucotomy: 5.iii.43.

Pre-morbid personality.—Elementary school education. Mother died when she was 15 and she took over the household duties. Father reputed to have been a drunkard, but patient liked him when sober. Elder sister went out into the world and "did well for herself," and patient mothered the younger one. Got on well with her brothers, but they did not approve of her marriage, and gradually they drifted apart. Said to have been an extremely feminine, gentle personality, not very self-reliant, friendly, affectionate, considerate, and sympathetic, but shy, timid, self-conscious, and reserved. She was conscientious, meticulous, truthful and religious; inclined to self-pity, apt to worry and with feelings of inferiority. Relationship with her husband was good, but mainly because of his extreme tolerance and indulgence. Made no friends outside the family; never went anywhere without her husband; would not go in a train and seldom in a bus. No real interests, listened indiscriminately to the wireless and occasionally went to the cinema. Sexually frigid; never had any children because she was afraid of childbirth and intolerant of noise.

Morbid personality.—It is difficult to draw any dividing line between the pre-morbid and morbid personalities. There was a history of ill-health since the year preceding her marriage at the age of 22. Patient attributes it to her brother's disapproval of her marriage. She became anxious, unable to eat and sleep properly. Three years later she became more profoundly depressed and suicidal, and had to go into a nursing home. About 1931 began to suffer with pain in her jaws, which was only aggravated by extraction of her teeth. This pain continued, and she could only sleep with sedatives. September, 1940, a course of E.C.T. with considerable improvement, but still demanding sedatives because of the pain; effect wore off after six months. In 1942 she began to complain of pain in her abdomen and back, like toothache.

5.iii.43: Leucotomy. Considerable improvement followed, the pain became bearable and finally disappeared, and she had no further medicine.

Post-leucotomy personality.—Less dependent on her husband, but is also less truthful, less kind and considerate and more quick-tempered. Does not worry at all about the estrangement from her brothers. She is rather self-indulgent, tactless, critical, obstinate and intolerant. Uses very strong language at times, which she would never have done before. Has no friends outside the family and does not seek any, but will start a conversation with anybody—a thing unheard of before the operation. Much more independent; goes shopping by herself and will travel by bus or train; had developed a passion for the cinema and listens to the wireless a great deal, using it entirely for her own pleasure and caring nothing if it annoys other people. Reads more, but indiscriminately, light books preferred. Sexual frigidity much diminished. Husband thinks that now patient would not bother to defend or support him, whereas formerly she would have stuck by him through thick and thin. He thinks she would not be unduly upset if he died, but would be quite capable of going to the cinema within a week. Never wants to go to church.

Summary.—A woman of average intelligence and little education, whose interests, originally centred in her family, became increasingly concentrated on herself. Disapproval of her marriage by her brothers seems to have led to emotional conflicts, which finally issued in depression and hypochondriasis. She was strongly attached to her husband and her family, but very dependent on the former and did not assume normal adult responsibilities. Keenly aware of her own feelings, she showed some consideration and sympathy for others, though her own feelings and her own interests took precedence over all others, until she became conscious of little beyond her own pains and anxieties. Since her operation this preoccupation with herself has gone, and films, shops, wireless programmes and books claim her attention and interest; but although less self-preoccupied she is more egoistic and self-indulgent, and has as little regard for the feelings of others as she has for her own, and there is a definite diminution of emotional depth, though her superficial contacts with other people, including her sexual relations with her husband, are much easier and freer. There is also a definite loss of interest in religion.

FEAR FACTORS IN FLYING PERSONNEL.

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SECTION I.—INTRODUCTION.

INTEREST in the psychological concomitants of flying was greatly stimulated by the outbreak of war in 1939. The rapid increase in size of the Royal Air Force and the ever-increasing "airmindedness" of the general public led to a far wider realization of the growing importance of this comparatively new field of enquiry.

The necessity for the study and treatment of mental illnesses occurring among flying personnel was recognized at an early stage. Special centres were opened in this country for the diagnosis and treatment of psychological disorders in the Royal Air Force, with special reference to those occurring in air-crews. Many of the medical officers working in these centres were handicapped by their total ignorance of aviation, and the consequent difficulty in understanding and appreciating the various stresses to which flying personnel are exposed. In addition, many of the cases referred to these centres were well advanced, and, in those days, specialist officers had few opportunities of seeing early cases, or of gaining an insight into living and working conditions on operational stations.

It was considered that a useful contribution to our knowledge of the psychological effects of flying might be made by means of an investigation of fear factors in pilots and members of air-crews living and working on a typical bomber station.

Fear was selected as the subject to be investigated because it figured prominently during informal conversations with air-crew personnel. It is not proposed to offer any definition of fear, or attempt to explain its mechanism, but rather to present, in order of importance, those factors which stimulate fear (as understood by the layman) in healthy young men engaged in the dangerous occupation of night bombing.

The clinical material considered here was obtained by direct questioning of flying men who were well known to the writer, and among whom he lived and worked for over two years. Many are now dead or missing.

In order to achieve some degree of standardization, it was necessary that personnel selected for questioning should conform to certain rigid conditions, which will be described in the next section.

SECTION II.—METHOD OF OBTAINING DATA.

It was decided that flying men as near "normal" as possible should be used, so that the influence of factors not connected with flying might be eliminated as far as was practicable.

To this end, the following restrictions governed selection, and only those men who fulfilled the conditions listed below are included in the total of three hundred cases submitted.

- (1) Completion of a minimum of ten operational sorties.
- (2) Negative personal history for any form of "nervous" illness.
- (3) Negative family history (father, mother and siblings) for any form of "nervous" illness.
- (4) Never reported sick for psychological reasons, or considered mentally ill by a superior officer or medical officer, or regarded as lacking in confidence or moral fibre.
- (5) Never removed from flying duties, or given less arduous ones, because of fear, or any other psychological reason.
- (6) Frank admission of fear while flying, with decision to carry on with flying duties notwithstanding this fear.
- (7) Willingness to co-operate in this investigation, and to give careful introspective consideration to the subject.

It will be appreciated that these restrictions narrowed the field of inquiry very considerably, and that for practical purposes all the men questioned may be regarded as "normal" individuals, who experienced "normal" fear reactions.

Three hundred flying men were asked, individually, to prepare a list, in descending order of importance, of hazards concerning which they experienced fear while actually engaged in operational flying. Each list was then discussed at length with its author.

During the early stages of the investigation it became apparent that there were wide variations of opinion both regarding the actual factors selected, and also their relative importance. In addition, marked differences appeared which seemed to depend on the particular flying duty upon which the individual was engaged. This latter complication had not been foreseen, and when this was realized, it was decided to question equal numbers of men engaged on different flying duties, so that a balanced result might be obtained.

Five different flying categories were selected: Pilot, Navigator, Wireless Operator, Flight Engineer and Air Gunner. The total of three hundred cases was composed of sixty of each of these categories.

From the three hundred lists obtained, twenty factors which were mentioned most commonly have been selected for consideration. These factors were arranged in order of importance, as shown by their frequency and positions on the three hundred lists. They were then examined in relation to the five separate flying categories mentioned above, and again arranged in order of importance for each of the five categories, as shown by the sixty lists from each category.

SECTION III.—FEAR FACTOR TABULATED.

TABLE A.—*Fear Factors in Order of Importance, as Assessed by Three Hundred Flying Men.*

1. Fog.	11. Ice.
2. Flak.	12. Fire.
3. Searchlights.	13. Inexperience.
4. Engine failure.	14. Bad flying country.
5. Fear of showing fear.	15. Frostbite.
6. Lack of confidence in other members of the crew.	16. Oxygen defects.
7. Disfigurement.	17. Airsickness.
8. Clouds and rain.	18. Landing at a strange aerodrome.
9. Enemy fighters.	19. Collision.
10. Non-completion of operational tour.	20. Aircraft faults.

TABLE B.—*The Same Factors, Assessed by the Same Men, but arranged in Order of Importance in each of Five Different Flying Categories.*

I. PILOTS.

1. Fog.	12. Lack of confidence in other members of the crew.
2. Flak.	13. Fire.
3. Searchlights.	14. Non-completion of operational tour.
4. Fear of showing fear.	15. Inexperience.
5. Enemy fighters.	16. Frostbite.
6. Engine failure.	17. Collision.
7. Ice.	18. Oxygen defects.
8. Bad flying country.	19. Aircraft faults.
9. Clouds and rain.	20. Airsickness.
10. Disfigurement.	
11. Landing at a strange aerodrome.	

2. NAVIGATORS.

1. Fog.	11. Airsickness.
2. Clouds and rain.	12. Landing at a strange aerodrome.
3. Flak.	13. Collision.
4. Searchlights.	14. Disfigurement.
5. Enemy fighters.	15. Fire.
6. Fear of showing fear.	16. Non-completion of operational tour.
7. Ice.	17. Frostbite.
8. Bad flying country.	18. Inexperience.
9. Engine failure.	19. Oxygen defects.
10. Lack of confidence in other members of the crew.	20. Aircraft faults.

3. WIRELESS OPERATORS.

1. Flak.	11. Non-completion of operational tour.
2. Fog.	12. Fire.
3. Searchlights.	13. Inexperience.
4. Engine failure.	14. Frostbite.
5. Fear of showing fear.	15. Bad flying country.
6. Enemy fighters.	16. Landing at a strange aerodrome.
7. Lack of confidence in other members of the crew.	17. Aircraft faults.
8. Clouds and rain.	18. Oxygen defects.
9. Disfigurement.	19. Airsickness.
10. Ice.	20. Collision.

4. FLIGHT ENGINEERS.

- | | |
|---|---|
| 1. Engine failure. | 11. Disfigurement. |
| 2. Flak. | 12. Clouds and rain. |
| 3. Aircraft faults. | 13. Inexperience. |
| 4. Fog. | 14. Non-completion of operational tour. |
| 5. Enemy fighters. | 15. Frostbite. |
| 6. Fire. | 16. Bad flying country. |
| 7. Fear of showing fear. | 17. Airsickness. |
| 8. Lack of confidence in other members of the crew. | 18. Landing at a strange aerodrome. |
| 9. Ice. | 19. Oxygen defects. |
| 10. Searchlights. | 20. Collision. |

5. AIR GUNNERS.

- | | |
|---|---|
| 1. Flak. | 11. Fog. |
| 2. Enemy fighters. | 12. Oxygen defects. |
| 3. Searchlights. | 13. Clouds and rain. |
| 4. Lack of confidence in other members of the crew. | 14. Non-completion of operational tour. |
| 5. Aircraft faults. | 15. Inexperience. |
| 6. Airsickness. | 16. Collision. |
| 7. Disfigurement. | 17. Fear of showing fear. |
| 8. Fire. | 18. Ice. |
| 9. Frostbite. | 19. Bad flying country. |
| 10. Engine failure. | 20. Landing at a strange aerodrome. |

SECTION IV.—OBSERVATIONS ON TABLE A.

1. *Fog*.—Fear of fog was described as a sense of helplessness, apprehension, and of being lost. The knowledge that accurate flying instruments were available inside the aircraft did not appreciably lessen this fear. Even experienced flying men often become convinced, when flying in fog, that their instruments are inaccurate, and that they are not flying on a straight and level course. They imagine that the aircraft is climbing, diving, banking, turning, or flying upside down. After any aerial manoeuvre, personnel are not satisfied that normal flight has been resumed. Aircraft movements which may be due to changing wind currents, such as pitching, yawing or rolling are imagined or exaggerated.

In general the sense of equilibrium may become greatly disturbed, and there is a strong temptation to fly by instinct rather than by instruments.

2. *Flak*.—This fear was seldom analysed, and personnel found great difficulty in describing what characteristics of flak chiefly concerned them. Different types of flak, such as light and heavy; different concentration, such as occasional and intense; different heights at which encountered; and proximity of bursts, were not usually considered separately.

The fear of flak is a general fear of the aircraft being hit.

3. *Searchlights*.—Enemy searchlights only are considered. It is the feeling of being trapped which makes this factor so important. Temporary dazzling by searchlight glare is a secondary consideration.

Tinted goggles, darkened anti-glare windows, or curtains, do little to relieve mental tension, the crew being well aware that, though relieved of dazzle themselves, they are still conspicuous from the ground.

There was a noticeable tendency for the less experienced flying man to place this factor lower in their lists. That is, a man who had completed, say, twelve operational sorties, would regard the hazard of searchlights as being relatively less important than would a man who had completed, say, thirty sorties.

4. *Engine failure.*—This factor appears surprisingly high on the list, when the reliability of modern aero-engines is considered. This investigation was carried out entirely on a unit where four-engined aircraft were used, and the importance attached to engine failure may well vary considerably on single and twin-engined units.

The occurrence of some relatively minor engine trouble was common, and frequently resulted in non-completion of a sortie, and early return to base. The difficult decision whether to carry on or turn back is the responsibility of the captain of the aircraft, and wide variations, in apparently identical circumstances, were noticeable. The distinction between prudence and timidity in these cases is a very fine one.

5. *Fear of showing fear.*—This was another surprising result. It was a subject never discussed, or even mentioned, generally, during informal conversations in Messes or Crew-rooms, but which often appeared during intimate individual talks. Many outstanding flying men experienced this fear in a severe and acute form. An excellent pilot related how on one occasion when approaching a heavily defended target, and anti-aircraft shells were bursting all around, he shouted to the bomb-aimer, "For God's sake drop them here and let's get out of this." A few moments later he found that his inter-communication telephone was switched off and that none of his crew could possibly have heard him. His relief at this discovery was so intense that he had no difficulty in continuing to the centre of the target area. It is interesting that none of the men questioned were ashamed of fear, but only of showing it.

6. *Lack of confidence in other members of the crew.*—The best crews were composed of men who had complete confidence in each other's ability and integrity. If one or more members of a crew were considered "shaky" by the remainder they were a potent cause of uneasiness and apprehension.

The different duties in a crew had a marked effect upon individual liability to suspicion by other members of the crew. This point will be elaborated in Section V.

7. *Disfigurement.*—This was another condition not readily discussed. Disfigurement by burning was invariably the disability feared. This did not appear to be an expression of vanity in the majority of cases. It was feared rather because men thought it would decrease the prospects of successful employment, or of matrimony, after the war.

8. *Clouds and rain.*—As in the case of fog, and, indeed, bad weather generally, this was really a fear of becoming lost. It is interesting that clouds and rain, while generally considered together on the majority of lists, were kept quite distinct from fog, and also were placed much lower in order of importance.

9. *Enemy fighters*.—During the period of investigation the aircrew personnel questioned were engaged almost exclusively on night bombing. This paragraph, therefore, refers to enemy night fighters. It was only on bright, clear moonlit nights that fear of fighters was experienced. Under these conditions, the emotion was intense while over enemy occupied country, and over the sea.

Many flying men stated that this fear was most useful in keeping them alert on the return journey, when fatigue was liable to impair efficiency.

10. *Non-completion of operational tour*.—The last five sorties of a tour became progressively more difficult than their predecessors. This fact was well recognized, even by men who were only part of the way through their first operational tour, and had, therefore, no personal experience of the closing stages.

Men who have completed one or more operational tours agree that fear of non-completion of the tour becomes progressively more intense during the last five sorties. There are no particular hazards which are peculiar to these sorties.

11. *Ice*.—Accretions of ice on the wings are referred to particularly under this heading. They may form a serious addition to the total weight of the aircraft, rendering climbing or even level flight impossible.

Modern improvements in methods of nullifying the effects of ice will probably reduce the importance of this factor.

12. *Fire*.—This factor was described as fear of fire occurring in the aircraft, whatever its cause. The possible origin and results of such fire were not usually consciously elaborated, with the exception of factor No. 7 (Disfigurement). This, although a result of fire, was considered separately, and assessed as being of greater importance.

Aircraft fires are of common occurrence, and the majority of flying personnel have witnessed at least one such during their training period, and before joining an operational squadron.

13. *Inexperience*.—Although this was given as a cause of fear by many of those questioned, opinions differed widely regarding its importance. There are certain advantages in being new to the job. The inexperienced man is ignorant of the seriousness of many hazards encountered. With increasing experience, the flying man learns to assess the relative importance of different emergencies.

On the other hand, the newcomer is more likely to panic when confronted by sudden unexpected danger, and to imagine or exaggerate unpleasant eventualities.

All the men questioned were experienced at their work, having completed a minimum of ten sorties, and it is an interesting sidelight on the essential frailty of human nature that such a factor should exist at all.

14. *Bad flying country*.—Under this heading are included natural hazards such as mountains, sea and forests, and man-made hazards such as cities and balloon-barrages. Although given as a specific fear factor, discussion revealed that flying over difficult country lead to a general increased mental tension, and alertness, rather than a definite fear of any particular result of such conditions.

15. *Frostbite*.—Mild degrees of frostbite, chiefly of the fingers, but also

affecting the ears, nose and toes occurred frequently during the winter months. Air-crews are well aware of this danger, more especially as it is one of the subjects upon which lectures to all flying personnel are given by medical officers. They appreciated the insidious onset and possible serious effects of this condition.

Better heating of aircraft, and improved personal protection by means of electrically-heated clothing, are doing much to minimize this hazard.

16. *Oxygen defects.*—The vital importance of an adequate oxygen supply is well recognized by experienced flying men. This subject, also, is frequently stressed by medical officers in their regular lectures to air-crews, and, in particular, the spurious sense of well-being which may, in reality, indicate the early stages of oxygen deficiency.

Headaches, dizziness, and nausea, occurring while flying at heights above 10,000 feet, were frequently attributed to faults in the oxygen supply system. In addition, air-crews complained occasionally of unpleasant odours emanating from the oxygen masks.

In point of fact, these odours were never proved to be due to contaminating impurities in the oxygen supply, but were caused by a "rubbery" smell from the mask itself, or to engine fumes which had gained access through an ill-fitting mask.

17. *Airsickness.*—With experienced air-crews, airsickness is not a common disability under normal flying conditions. Personnel peculiarly liable to this disability are usually rejected during training. In particularly bumpy weather, or violent evasive action, any member of a crew may experience nausea, or actually vomit.

Airsickness renders a man incapable of carrying out his duties with maximum efficiency, and fear of being rendered inefficient is the real underlying factor.

18. *Landing at a strange aerodrome.*—Changing weather conditions, shortage of petrol, damage to the aircraft, or many other reasons often necessitate diversion of aircraft to stations other than their own. The difficulties of landing at night on a strange aerodrome are often regarded as the "last straw" after an arduous and exhausting flight. Added to this is the feeling that the sortie has not really been completed until base has been reached. A meal, a few hours' sleep, and a daylight return to base are regarded as poor substitutes for a straightforward "out and home" trip.

19. *Collision.*—Concentrated bombing necessitates the convergence of large numbers of aircraft over the target area at the same time. Collisions do occur, and are often witnessed by the crews of other aircraft not involved. This factor is only important for a short period out of the total duration of the sortie, but occurs when other fear factors, such as flak and searchlights, are also at their maximum intensity.

20. *Aircraft defects.*—This heading includes every part of the aircraft, such as fuselage, instruments, and armaments, with the exception of the engines, which received much higher priority (Factor 4). It is a tribute to the aircraft manufacturing firms that this factor should appear so far down the list.

The fear that "something will fall off" is common during the beginner's first few flights. It is interesting that this should persist among experienced men with hundreds of flying hours to their credit.

SECTION V.—OBSERVATIONS ON TABLE B.

1. *Pilots*.—The pilot is usually, although not always, the captain of the aircraft. As such, his responsibilities are numerous and exacting, quite apart from those connected with the actual flying of the machine. Upon the pilot rests, ultimately, the safety of the crew and the aircraft. Sound judgment and rapid decisions on many subjects, such as advisability of turning back to base, emergency landing, baling out by parachute, and other vital matters, are essential.

It would be natural to expect problems affecting the team as a whole, and those more intimately concerned with leadership, to influence pilots more than other members of aircrews, and this supposition is supported by the variations shown in the pilot's list of factors as compared with the general list.

Thus, fear of showing fear to other members of the crew takes precedence over engine failure in the pilot's list. Fear caused by lack of confidence in other members of the crew drops from sixth place to twelfth; because the pilot, more than any other member of the crew, is independent in action.

Ice and bad flying country appear relatively higher; these are essentially "team" hazards by comparison with disfigurement and fear of not completing the tour, which are essentially personal.

Landing at a strange aerodrome is largely the pilot's added responsibility, and therefore appears much higher in his list.

Airsickness appears last. The pilot is occupied all the time the aircraft is flying, and this position for airsickness supports the theory that concentration on essential duties diminishes the likelihood of airsickness.

In general, it may be said that the pilot's list is a less individual and more team-spirited one than the average.

2. *Navigators*.—The navigator represents the eyes of the aircraft. He tells the pilot what course to steer, what atmospheric conditions are to be expected, the exact position of the aircraft, the most favourable height at which to fly, and gives him much other important information. His chief responsibility is that the aircraft shall not lose its way. The importance of the navigator in an aircrew tends to be minimized by non-flying personnel. His is a specialized, highly responsible, and exacting post demanding constant vigilance.

Factors which particularly affect his duties, and increase his difficulties, might be expected to appear prominently on the navigator's list. Thus clouds and rain take second place instead of eighth. Bad flying country rises from fourteenth place to eighth, while engine failure drops from fourth to ninth place. Airsickness is placed eleventh instead of seventeenth; this is difficult to explain. When no second pilot was carried many navigators were in the habit of sitting next to the pilot for part of the sortie. Here they were in a similar position to the front-seat passenger in a motor-car, who is notoriously "edgy" and desirous of driving himself. Possibly this awareness of the probable evolutions about to be performed, which is not shared by other members of the crew, may be a partial explanation.

Fear of landing at a strange aerodrome is placed twelfth instead of eighteenth. This can be explained on the grounds that it is the navigator's duty to direct the pilot to such an aerodrome—by no means an easy task in bad weather.

Fear of collision rises from nineteenth place to thirteenth. Again, this may be related to the navigator's better visibility by comparison with the remainder of the crew.

3. *Wireless operators*.—The Wireless Operators' list in Table B corresponds more closely with Table A than any of the other lists.

Recent technical advances in radio-location and allied sciences have greatly increased the responsibilities and importance of the wireless operator. During the period of investigation (1941-43) these improvements were being brought into general use. Wireless operators were becoming busier, and their speciality regarded as a full time occupation, rather than one which could be combined with other duties, such as those of air gunner.

This period was, then, one of transition. In the earlier part of it, the wireless operator was normally the member of the crew who made himself generally useful in many activities apart from his own particular work. Such duties as the care of sick or wounded members of the crew, minor repairs and adjustments to unserviceable equipment inside the aircraft, the distribution of refreshments, and other diverse occupations often fell to his lot.

In so far as any member of an operational crew can be regarded as a passenger, the wireless operator most nearly approximates to this. Apart from his radio contact with the outside world, the wireless operator is entirely dependent for his immediate safety and well-being on the other members of the crew. He is thus more likely to acquire a dispassionate attitude to the immediate problems of flight, and to rely more completely on others for the best solution of these, than are the remainder of the crew.

The factor of aircraft faults, which rises from last place to seventeenth, is related to responsibility for the efficiency of his intricate equipment during flight, and does not require further comment. No other observations are indicated in this category.

4. *Flight engineers*.—The complexity of modern aircraft engines, and the increasing use of multi-engined aircraft, led to the establishment of a special flying category, that of flight engineer. These individuals became responsible for the efficient maintenance of the engines during flight, and were provided with their own complicated and imposing array of instruments, quite distinct from those confronting the pilot.

The comparative novelty and the absorbing interest of this work to mechanically-minded young men led to intense keenness to excel, and, as a class, flight engineers were remarkable for their enthusiasm and initiative. Many authentic stories are recorded of aircraft landing safely in spite of apparently insuperable difficulties largely due to the ingenuity and resourcefulness of this member of the crew.

The list of fear factors provided by flight engineers shows interesting and significant variations from the general list. Engine failure takes first place, as might be anticipated. Aircraft faults rises from twentieth place to third. This indicates the flight engineer's concern for the aircraft as a whole, in addition to his particular interest in the engines.

Aircraft fires originate from an engine more frequently than from any other source. Hence fear of fire rises from twelfth to sixth place. Searchlights drop

from third to tenth place. This is difficult to account for. Possibly the intense interest and absorption in their duties which were so characteristic of all flight engineers questioned resulted in a comparative indifference to external factors not directly affecting engine performance. This indifference was, of course, only partial, as shown by the importance attached to other external factors. The same reason may account for the lowered position of disfigurement, which falls from seventh to eleventh place.

5. *Air gunners*.—Perhaps the most noticeable characteristic of air gunners was their marked individuality, for which there are two main reasons.

In the first place, the age limit for air gunners was higher than that for other members of the crew. This led to older men holding these posts, and gunners between thirty and forty years of age were common, and even men of forty and over were by no means rarities.

In the second place, the air gunner's position and his duties in the aircraft tend to encourage individual responsibility. The rear gunner in particular, unable to see the other members of the crew, and dependent on inter-communication telephone for any contact with them, naturally tends to become self-reliant.

Long hours of solitary confinement, spent in a turret which permits a minimum of movement, develop detachment of outlook and a self-sufficiency not found to the same extent in other flying personnel. Some air gunners become introspective, and most tend to philosophical ruminations upon the meaning of life in general and the war in particular.

In the air the gunner's main duty is to ward off attack by hostile aircraft. Enemy fighters as a fear factor rises from ninth place on the general list to second on the air gunner's list.

Lack of confidence in other members of the crew rises from sixth to fourth place, probably because as a result of their position, many gunners are unable to see what the rest of the crew are doing.

Aircraft defects, which include faults in turret mechanism as well as in the guns themselves, rises from last place to fifth. This result might be expected when the gunner's duties are considered.

Airsickness rises from seventeenth place to sixth. There are several reasons for this. Aircraft movements are experienced most vividly at the extremities, therefore nose and tail gunners are more susceptible to airsickness than other members of the crew. The temperature inside these turrets is often lower than that inside the aircraft as a whole, and this may be an additional cause. Some difficulty in regulating the oxygen supply to the rear turret was experienced during the period of this investigation, and partial anoxaemia may have been a contributory cause. The cramped position necessitated by the size of the turret was another factor.

Frostbite rises from fifteenth to ninth place. This disability was relatively commoner in gunners than in other members of a crew, as a result of their more exposed positions.

Engine failure drops from fourth to tenth place. This is an indication of the air gunner's tendency to detachment and concentration on his own problems, already mentioned.

Fog drops from first to eleventh place. Enemy fighters are not likely to be encountered in foggy weather, and the gunner is not concerned with the problem of steering a course through fog.

Oxygen defects rises from sixteenth to twelfth place. Satisfactory oxygen supply to turrets, especially the rear turret, presents certain mechanical difficulties. These have now (1945) been largely removed, but at the time of this investigation (1943) there were definite indications that some gunners were not always getting an adequate supply of oxygen. This fact was well known among flying personnel, and in the case of gunners, led to greater concern on this score than was usual.

Fear of showing fear drops from fifth place to seventeenth. This can be explained by the fact that both front and rear gunners are almost or completely invisible to the remainder of the crew for the major part of the sortie, and certainly so during the most dangerous part.

Ice appears eighteenth on the list instead of eleventh. This factor, which affects so seriously the efficiency of the aircraft in flight, is more a problem for the pilot and flight engineer than for a gunner.

SECTION VI.—PREDISPOSING AND MODIFYING FACTORS:

Any investigation which attempts to measure or explain human emotions is inevitably influenced by such emotions. Results are modified by the individual mental characteristics of the investigator and his subjects to a degree that cannot be estimated with any accuracy. Clearly it is impossible to eliminate these variables entirely. Psychological studies, by their very nature, cannot be truly scientific in the fullest sense of the word, at any rate with our present knowledge. Psychology is not an exact science—some say it is not a science at all. Our standards of normality in the mental sphere are ill-defined, and there is no general agreement upon them.

Notwithstanding the rigid conditions which governed selection of personnel for this investigation, hereditary, personal and environmental influences could not be excluded, or even gauged with any pretence of accuracy.

The numerous factors, personal and general, in their daily lives which predispose to and accelerate psychological wear and tear in flying personnel have been, and are being studied by other workers. This paper is confined to normal men, in whom there was no discernible evidence of mental trouble, and no attempt is made to cover this vast field.

Reference will be made only to a few of the more important general factors which noticeably affected the men questioned.

Personal experience or observation of dramatic and dangerous flying adventures render an individual particularly susceptible to fear of similar experiences in future. We may say that his threshold for that danger is lowered, or that he has become conditioned to it. Thus a pilot who has escaped from a burning aircraft is particularly susceptible to fear of fire while flying; an air gunner whose turret has been hit by enemy bullets is particularly susceptible to fear of enemy fighters; a navigator who has watched two aircraft collide in the air is particularly susceptible to fear of collision. These and

comparable experiences were encountered frequently during the investigation, and were regarded as inevitable variables.

There are many factors which contribute to fatigue, and such fatigue is of great psychological importance among aircrews, both during flight and on the ground. In flight, such matters as aircraft noise, vibration, engine fumes, cold, unsuitable clothing, cramped positions, hunger, inadequate oxygen supply, and many others could be mentioned, but are considered to constitute a study of their own.

On the ground, predisposing factors may be either general or pre-operational, and there is considerable overlap between these two. General factors include such matters as sleep, exercise, food, working hours, leave, living conditions, squadron morale, personal, domestic, financial and social affairs, including expectation of promotion or decoration.

Essentially pre-operational factors include type of target and anticipated opposition, efficiency or otherwise of preparations for the sortie, and most important, adherence or otherwise to a strict time-table. In this connection the adverse effects of delayed or abandoned sorties were most marked.

All these, and many other factors, had an undoubted effect in every case, and offer a wide field for further investigation. They are mentioned only to illustrate the complexity of the problem of psychological trauma in aircrews, and cannot here be considered in detail.

SECTION VII.—CONCLUSIONS.

Fear is a natural emotion experienced by all aircrew personnel during operational flying. It is not usually attached, during flight, to any particular hazard, unless that hazard has been encountered in a severe form previously, appears imminent, or actually occurs.

Considerable introspective effort is required on the part of flying personnel to attach fear to particular dangers, and when this is done, marked variations in assessment of importance of causative factors appear. These variations would seem to depend upon actual flying duties, as well as upon individual idiosyncrasies.

The fear factors considered here relate to a particular set of environmental conditions only, that is, night bombing of enemy-held targets in Europe by heavy bombers based in England. More recent work in the Far East suggests that a markedly different selection of factors occurred there.

The numerous personal and environmental factors which inevitably modify all psychological reactions are impossible, at present, of precise assessment.

There is great scope for investigation in this and related fields of aviation medicine. Such work should be carried out ideally by medical officers who harbour the twin interests of psychology and practical flying. Only in this way can the advantages of trained introspection be utilized to the full.

THE "CREATIVE SPELL" OF SCHIZOPHRENICS AFTER LEUCOTOMY.

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I.

THE artistic activities of schizophrenics are said to be dependent upon the quality of their thought disorder. The thinking regresses from the conceptual, to a perceptual or visualistic level; symbols do not stand for a meaning, but become identical with the meaning itself. The logic alters from the deductive, to the affective type. These disturbances express themselves in magic thinking, which in its turn gives impetus to magic actions resulting in the artistic products of the schizophrenics. It seems that the creative spell coincides with the thought disturbances just described, and that the artistic products are, as Kris (1946) pointed out, pure magic.

The formal elements of the schizophrenic paintings have been recognized by a tendency to fill in the space, by their over elaboration and stereotypy; in reproducing parts split from wholes, at the same time in pictorial condensations in reproduction; in prevalence of the symbolic elements, in production of obscene pictures and in loss of form and colour sense.

The schizophrenic personality is changed after the operation of prefrontal leucotomy by the production of a circumscribed brain lesion. These personality changes are reflected in the artistic activity of the patients and an attempt is made in this paper to evaluate the changes in connection with the artistic products. The report below is confined to a detailed description of two particular cases.

II.

Prior to a description of the cases the nature of the brain injury should be discussed. A "low orbital" prefrontal leucotomy was performed on both cases (Dax and Radley Smith, 1946). This cut lies in the frontal lobe, at a level of Brodman areas 24 and 32 on the medial—8, 9, 46, 45, 47 on the convex—11, 12 on the basal surfaces of the hemisphere. It severs the thalamo-cortical radiation to areas 10, 11, 12, partly, to 13, and partly the uncinate fasciculus. According to Dax and Radley Smith, this operative approach interferes with the integrative functions of the "emotional cortex." The present writer (Reitman, 1946) emphasized that the operation gives rise to a triad of symptoms, characterized by euphoria, extraversion and over activity. These postoperative clinical symptoms show clear cut differences from the symptoms produced by leucotomy at other levels.

The artistic products of patients with brain injury of various localization exhibit a certain orderliness, a tendency to avoid empty spaces, and perseveration, whilst there is a disordered colour choice present. Schilder (1934) described changes of configuration in the artistic products of patients suffering from organic brain diseases. He found that there is a tendency to curves instead of angles, that the figures may be contracted or expanded and elongated, and that adjoining configurations may be completely separated from each other. It will be seen that these disturbed figure-background relations feature significantly in the material analysed below.

III.

CASE I.—A female patient, aged 19½, a hairdresser, was admitted in 1945 suffering from hebephrenia. She had had no illness before her present breakdown, which commenced 4 months before her admission. She became dreamy, felt always tired, was inattentive, could not concentrate, was inaccessible to psychological treatment. Later she developed persecutory ideas, and some childish ideas of reference.

The patient came of a fairly good stock and her premorbid personality was adequate. The family history was less satisfactory; the father was temperamental and deserted the mother. Patient had one brother and they were devoted to each other, and from her brother's utterances, incestuous relationship was suspected. Her school years were uneventful; she was never brilliant, but after leaving school she took up hairdressing, which she enjoyed and did successfully.

On examination, she was dissociated, dreamy and vacant; she giggled in a childish manner, grimaced a lot and exhibited bizzarrisms and ambivalent attitudes. She had frequent short attacks of screaming. She received insulin treatment (42 comas), followed after an interval by a course of 15 electrical convulsions, without improvement; in fact her mental condition deteriorated. She became more vacant, had marked emotional blunting and intellectual dulling. In view of her progressive deterioration, 6 months after her admission, a leucotomy was performed of the type already described. She had an uneventful convalescence and 10 days after operation the clinical triad, so typical for this type of operative approach became apparent. She improved progressively and 5 months after the operation she was discharged, making a full social readjustment; 7 months after her discharge, she maintained her recovery.

Before the operation she was several times asked to draw, but she constantly refused, until after much persuasion she drew a man and a house, in a conventional childish manner. She could not use a brush and paint. 6 days after the operation she consented to attempt a "painting," which she completed the same day. (Fig. 1.) Whilst it shows many of the typical characters of the schizophrenic painting, its interest lies in the fact that the emphasis is more in the background than in the foreground. In the background four phallic symbols are depicted and some of these background paintings amount to obscenity. They are, however, merely "doodles" with the brush and give a colourful background rather than "parts split from the whole." The patient's immediate comment on this picture, as well as on the following ones was: "That's how I feel." Ten days following the operation she completed her second picture. (Fig. 2.) The change in this is apparent. The emphasis is no longer in the background, but is shifting towards the foreground. Though the outlines of the legs are half lost in the background, they can clearly be distinguished, and the frightened figure in the foreground dominates the painting. Her third painting was completed three days after the second one and it took her two days to do it. She seemed to lose interest in painting, but was over active in many other ways in the ward and in the occupational department. The top end of the painting now carries her initials as well as her Christian name; it does not represent anything but decorative elements. The foreground is dominated by two heads of the 'Wot! No. . . . ' variety, as seen in the well-known cartoon. The two well-arranged heads are not over-painted and gaze through the picture, almost as a piece of sanity entering into her



FIG. 1.



FIG. 2.



FIG. 3.

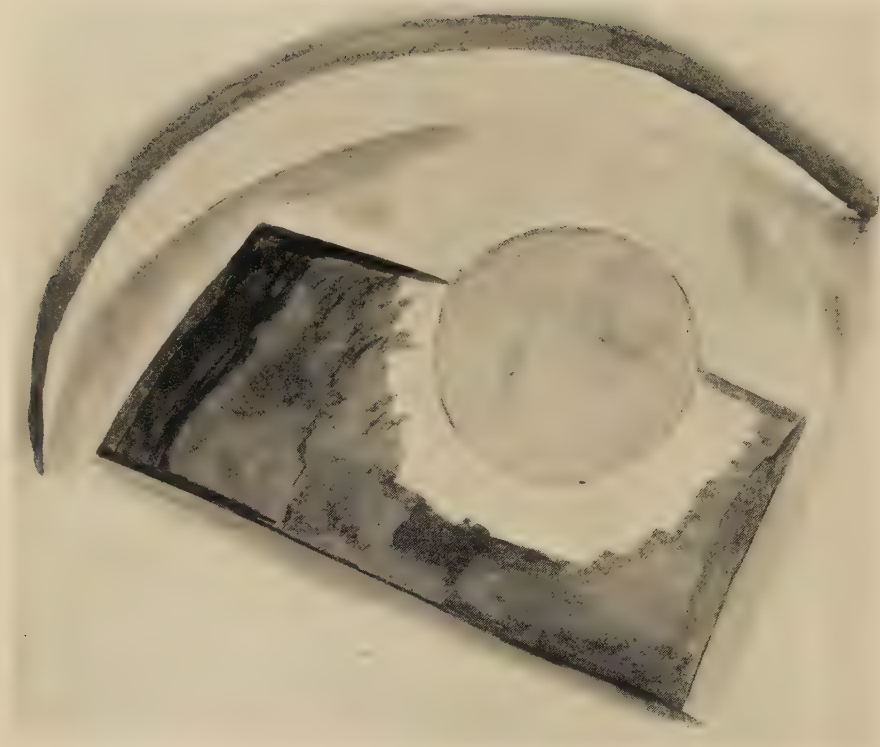


FIG. 4.

creative spell. Indeed, this was her last artistic product. After much persuasion she tried to copy a koala bear, then she painted a girl's head with yellow hair, without background and in a childish fashion. She refused to do any more and has never painted since. Six weeks later her three paintings were put before her; she could not believe she had painted them and had no idea what they meant, but pointed smilingly to the two heads in picture three, drawing attention to the 'Wot! No . . . ' cartoon ideas. It seemed that the only contact she could take up with her creations was the "sane" link. Later on she underwent sodium amytal hypnoanalysis, when again she was questioned regarding her painting. She accepted rather submissively that the drawings were her own but in No. 3 picture she remained indifferent regarding her two head figures. No. 2 picture she explained in a drowsy way as "an inferiority complex." "This one," she said, "is squashed beneath those huge feet. There is nothing really to be afraid of; it is just an inferiority complex." The No. 1 picture was presented last. She remained silent for a long time and her responses were inadequate. Then she started to talk about her brother, but stopped abruptly. After much encouragement she suddenly "recognized" the background paintings as phallic symbols: she became resistant to further hypno-analysis; she suddenly admitted mutual masturbation whence her knowledge of the background paintings originated, but denied that this was done with her brother. She remained resistive and hypnoanalysis did not elicit further data. Afterwards, however, it seemed that the procedure caused a slight setback, but in a few days she proceeded with her improvement. In view of the disturbing influence of the hypnoanalysis, it was not repeated and direct discussions did not yield further information and she denied recognizing anything in No. 1 and No. 2 pictures. In other words, in her undisturbed conscious state all emotional contact with her depicted subconscious experiences was lost.

It is a controversial question whether one should have gone on with psychological exploration in this case. We felt that to explore her deep psychological structure would have been coupled with emotional upsets, endangering her progressive recovery. Two conclusions, however, can be made in view of the available material. Firstly, that the operation activated a creative spell of a typical schizophrenic art. Secondly, that this creative spell represented an abreaction and its psychopathological factors had a deep significance for the patient. Thus, it was a complementary and a spontaneous re-adjusting factor, with diagnostic significance. The acute "perceptual" spell and its abreaction was followed by conceptual thinking and emotional re-adjustment.

CASE 2.—A female music teacher, aged 27, admitted in 1946, suffering from schizophrenia. During the year prior to her admission she gradually became alienated from her whole environment, suffered from depersonalization, was vague and vacant. She made a suicidal attempt, though she neither felt suicidal nor was depressed. Her illness progressed, she became autistically inclined and completely inaccessible to psychotherapy. She giggled and cried without reason. She was admitted to an Emergency Hospital where the diagnosis of schizophrenia was made, and she was given insulin shock treatment. She developed reactions of the spontaneous hyperinsulinism type, and after 13 comas her treatment had to be terminated. She commenced E.C.T., had 8 shocks, did not respond well and in spite of risks it was thought best for her to recommence insulin treatment and she had 25 further comas. She developed a state described as depressed, sullen and taciturn and she made a vague suicidal attempt. As the patient seemed refractory to treatment, she was advised to come to Netherne with a view to having a leucotomy operation. When admitted, she seemed detached, dreamy, showed schizophrenic thought disorders, smiled vacantly, alternating this with a tearful condition.

Her pre-psychotic personality was a good one, her I.Q. bordered on 150. There was no mental illness in her family but her father is a chronic neurotic and there

has been a marked antagonism between him and the patient since her earliest childhood. She took her matriculation and started to study music and later to combine her musical work with teaching. She was always shy; a devout Anglo-Catholic; she had no sex experiences, though she was once in love but "nothing came of it."

After 21 days' observation, orbital leucotomy was performed. She had an uneventful convalescence and 9 days after operation she displayed the favourable reactions of the cases who respond well. At the time of writing, her personality readjustment is getting more and more complete and she is busy arranging her own future. She plays for hours on the piano and anybody who wants to listen to her "is welcome."

Prior to the operation, she was asked whether she would play the piano. In a tearful way she refused it, being as she said unable even to touch the keys, and that in any case she could not play before an audience. She was unable to give an explanation as to why. It was suggested to her to try and express her feelings in drawings; the idea fascinated her, and resulted in five pictures, of which two are reproduced. Fig. 3, as it was ascertained post-operatively, features fly-bombs, searchlights, a shelter with a grand piano, a broken clock and shattered musical notes. (In her first post-operative night she was confused, talking of fly-bombs, of a near miss, calling someone's attention to the broken clock, etc. Later she admitted her fears of being hit by the fly-bomb, but denied actual experience of a "near miss.") There is no need for deeper interpretation of such drawings. They represent fairly typical schizophrenic products, as so often discussed in the extensive literature on this subject.

The picture (Fig. 4) was done 4 days after the operation. The colour sense in it is better than in her former painting, but its formal elements are more "deteriorated," and its presentation is near to a diagrammatical, over-simplified picture. Eight days after the operation she painted a picture of a girl in a pleasant flowery surrounding, looking up to heaven, from where music was coming to her. The whole presentation was childish and unartistic. She herself said that it had not satisfied her and that she would rather try to express her feelings in composition (Except when studying, she never did any musical compositions.) This she did and her musical products will be discussed below. Before doing so, however, one more remark should be made regarding her drawings, which were discussed with her 14 days after the operation: her remark on Fig. 3 was, "It's pathetic"; and on Fig. 4, which she refused to believe was hers, "It's a mess." Since she began her music again she has not attempted any more drawings.

She produced five musical pieces, one of them is reproduced here. (Fig. 5.) Of the four not reproduced, two were very artificial, without any meaning for the patient, and the other was merely a musical joke.

The main character of her musical works lies in its conventional patterns. Whereas her drawings were deteriorated so far as their formal elements are concerned, in music she did not deteriorate into "modernisms." The tempo, however, in her first composition is alien. The second composition shows improved key sense, and the harmony of the composition is better than that of the first one; it is scholarly and well composed. Thus, though she showed a progressive improvement in the formal elements, artistically her work deteriorated in the third, fourth and fifth compositions. The reproduced composition had a great emotional meaning for her throughout her stay at the hospital, the others she discarded as dishonest and without much meaning. As far as their content is concerned, the euphoria and harmonical extraversion are the main characteristics. It is significant that with her progressive recovery and personality re-adjustment, she gave up composition and returned to her original interest: interpreting music, i.e., piano playing.

Although music reflects just as well as drawings do on the psychotic symptomatology (formally: the flight of melodies in mania; perseveration of

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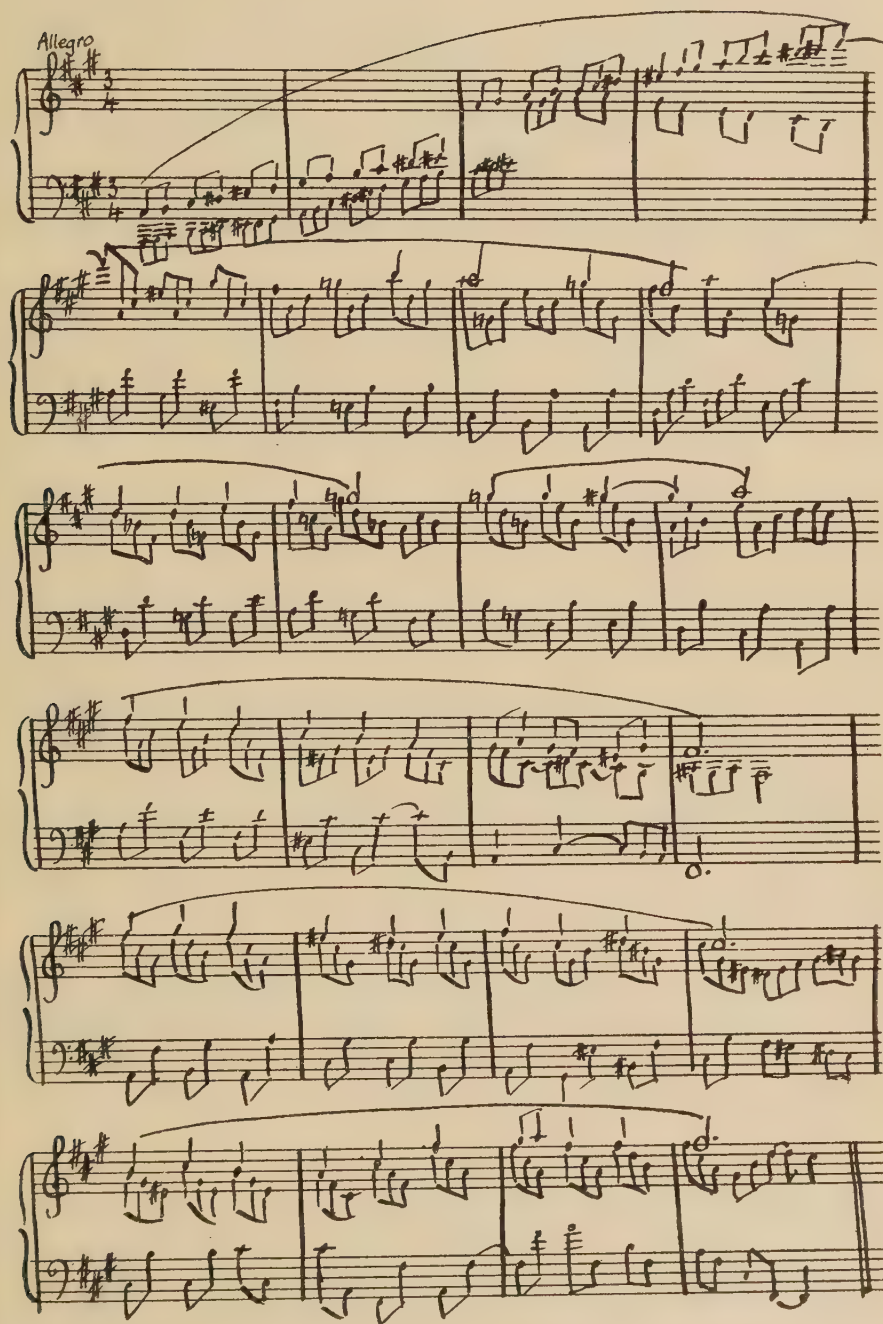


FIG. 5.

notes, flatness of melody in schizophrenia, etc.) the reproduced compositions are free of those characteristics, and they already reflect on the post-operative mentality of the patient. This music can hardly be interpreted on a neurological level, though its euphoria and extraversion may result from the orbital leucotomy. From a teleological viewpoint it represents a conscious cathartic phenomenon of a fleeting nature.

In this lies its dissimilarity to Case No. 1. The first patient's products remained on subconscious level and gave her a non-conscious catharsis. In the present case the leucotomy did not activate her productive art, but modified it only, and her modified musical art was a conscious but original and genuine self-expression.

IV.

The common factor in these cases is the creative spell activated or modified by the operative brain injury.—The typical features of the art activated through the operation were firstly its disorganised form-sense, and its chaotic appearance. Secondly, this art showed a rapid development towards organized form-tendencies, towards normal symbols and patterns. It seems that the orbital leucotomy gave stimulus to the personality, developing its artistic reactions. As these two patients were recruited from the "good response" group of the orbital leucotomy case material, they also illustrate that the personality with this type of operation does not deteriorate, but becomes stimulated. The present author has emphasized that the vague, dreamy, depersonalized, dissociated types react favourably to orbital leucotomy. The post-operative clinical triad, the euphoria, overactivity and extraversion, and the rapid personality reintegration denotes only superficially the favourable reactions. The two cases just presented illustrate, however, how deeply this stimulative effect of orbital leucotomy affects the personality. In accordance with clinical observation, the personality reintegration is a rapid one, as illustrated by the quick development of normal form-tendencies. But the two cases, especially Case 1, also gave an indication of the emotional tension behind the superficial, dreamy, dulled clinical appearance.

The emotional tension indicated offers an additional significance to the art products of these two patients. They subserved a form of non-conscious abreaction, giving a relief for the hidden tension. In this sense the function of these artistic products closely accords with the products of the true artist, hence they may be called genuine art products.

V.

The aesthetical question as to whether the spontaneous productions of psychotics do represent art, or are merely of the nature of art, seems to be a question already answered. The tendency of modern art is a turning away from reality, and this culminates in surrealism, which accepts the subconscious as the only reality. The surrealist artist does not try to transform his subconscious experiences into accepted symbols; this would be an analytical approach. The surrealists depict their subconscious as they state it is

experienced. Their failure is obvious from the facts just stated: the subconscious is not the only reality, and its artistic representation must necessarily be in recognizable symbols, because such are the true experiences of creative artists. But it is now agreed that the subconscious (and what it involves) is a free subject for artistic representation and if it is represented in an artistic way, it is justified. Most of the surrealistic products, however, are lacking in spontaneity, are artificial and do not reflect on true mental experiences.

The similarity between the presented drawings and surrealistic art products does not need elaboration. It seems that whereas the products of known great artists reflect their subconscious mechanisms, in psychotic artists the subconscious speaks directly, and its unusualness may not bar it from being called art. Yet none of the attempted explanations give an answer regarding the capability of patients to produce art; they only endeavour to draw attention to factors giving impulse to artistic activities.

SUMMARY.

(1) Artistic products of two schizophrenic patients, who underwent leucotomy are analysed.

(2) In Case 1 the leucotomy induced a "creative spell" which subserved catharsis.

(3) In Case 2 the leucotomy modified and reorganized the patient's creative spell.

(4) The importance of creative activity after leucotomy is stressed, and the aesthetical value of the art products is discussed.

I wish to express my thanks to Dr. E. Cunningham Dax for his kind help and suggestions, and to the Editor of this Journal for enabling the paintings to be reproduced.

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THE DEPERSONALIZATION SYNDROME.*

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DEPERSONALIZATION, or feeling of unreality, is a symptom which may occur as part of several psychiatric conditions, such as hysteria, anxiety and obsessional states, and some forms of schizophrenia and endogenous depression. The true derealization-depersonalization syndrome, however, in which the unreality symptom is the primary disturbance, is a quite peculiar and distinctive condition, which has received scant attention in most psychiatric textbooks and which appears to be becoming increasingly common in practice.

The first accurate descriptions of the condition were given by Mayer-Gross and Mapother, and by Guttmann and Maclay in their paper in the *Journal of Neurology and Psychopathology* (1936), in which the authors described the effects of mescaline sulphate on a series of depersonalization patients and their therapeutic response to the drug. The syndrome may be defined as a form of affective disorder in which feelings of unreality and changed personality are the most prominent symptoms.

The usual age-incidence of the condition is the 20 to 30 age-group, although one form may sometimes occur in the later years of life. The onset may be acute, following a severe emotional shock, as seen in some wartime cases, or gradual and insidious following prolonged stress or as an endogenous depressive state. It commonly occurs in personalities of the sensitive, intelligent, and affectionate type, and is much more common in the introverted imaginative than in the extraverted personality. It is never found in dull and backward individuals, and is also unusual in the inadequate schizoid personality type.

The depersonalization syndrome is characterized by five cardinal symptoms—namely, reality disturbance, affective disorder, thought disturbance, cephalic paraesthesia, and absence of projection features. To these a sixth might be added, that is, a high degree of responsiveness to anoxic therapy.

The unreality feelings, as pointed out by Mapother, are of two kinds: Depersonalization, or feeling of changed personality, and derealization, or feeling of unreality of the outside world.

The depersonalization symptom is commonly described by the patient as a feeling that his body has become changed in some peculiar way, and seems to be no longer his own, or feels as if dead. Other patients say that they feel as if turned into wood, rubber, or other such inert substance. He may also complain that his personality itself is altered, and that he feels changed into a different person, or as if he were two or more different people. He may

* Read at the meeting of the Northern and Midland Division of the Royal Medico-Psychological Association on October 10, 1946, at Winson Green Hospital, Birmingham 18.

state that his thoughts are strange, and of a sensation of being detached from his body, as if floating in the air ; his thoughts and acts seem to him to be carried on mechanically as if he were a mere machine or automaton.

The derealization symptom is usually described as a feeling that the outside world has become mysteriously changed, so that people and objects appear to the patient to be unreal, far away, lacking in normal colour and vividness, or even actually distorted in shape. Patients often say that they feel as if they were going about in a trance or dream, or as if there was a sort of veil interposed between them and the outer world. Some patients complain chiefly of derealization, while in others the feeling of loss of personality is the principal symptom ; more commonly, however, the syndrome is a combination of both derealization and depersonalization phenomena.

The affective disturbance is distinctive and rather characteristic. It is usually a quiet, depressed, apathetic state accompanied by a marked degree of perplexity and bewilderment, due to the strangeness of the unreality feelings. It is not the dull, confused, restless condition seen in katatonic and confusional patients, nor does it resemble the profoundly depressed, retarded state of the acute depressive. It differs equally from the tense and anxious misery of the anxiety neurotic, and the fearful, apprehensive state seen in the agitated depressed patient. A common complaint in derealization patients is the feeling of emotional poverty, with inability to experience the normal gradations of emotional feeling ; they are no longer able to enjoy food and other normally pleasant sensations, and experiences normally charged with emotional reaction no longer evoke any normal affective feeling or response.

Of sensory features, cephalic paraesthesia is a constant and distressing symptom. It is commonly described by the patient as a peculiar and unpleasant sensation referred to the head ; common terms used to describe it are " numbness," " emptiness in the head," or feeling " as if the brain was dead, or had stopped working," and it is always accompanied by great difficulty in concentrating and thinking clearly.

The thought disorder is one of slowness and difficulty in thinking, which differs from true retardation in being subjective rather than apparent to the examiner. Patients usually describe it by such expressions as " my mind feels a blank," or " my thoughts will not come." Characteristic is a marked impairment of the power of mental imagery ; the patient complains that his ideas do not come to him readily and his mental imagery, both visual and auditory, lacks its normal vividness, so that he is unable to conjure up mental pictures of familiar faces, scenes, and voices in the normal way.

Projection features, such as hallucinosis, delusions, and ideas of passivity and reference, are never seen in the true derealization syndrome. Clouding of consciousness and disorder of abstract thinking are likewise absent, and memory, insight, and judgment are not impaired. Although patients sometimes find difficulty in describing the peculiar sensations of unreality in words, there is no language disorder of the schizophrenic type.

On the motor side, there is generally some degree of underactivity and lack of spontaneity, but katatonic motor symptoms and true psycho-motor retardation are absent.

Other symptoms include insomnia, which is not, as a rule, severe, loss of appetite, and some deterioration of physical health in the severer cases. Anxiety symptoms, functional pains, and agitated states are not common in derealization patients, although they sometimes occur as symptoms secondary to the distressing unreality feelings. Fears of insanity, again due to the strange and terrifying derealization feelings, are not uncommonly found.

The derealization state is a condition which causes great suffering and incapacity, and in all but the mildest cases the patient is usually completely unable to work, on account of the difficulty in thinking and distressing mental and bodily sensations. In the severest cases the appearance of perplexity and bewilderment in combination with the marked depression and lack of volition may give the impression at first of a confused, almost stuporose condition, which, however, is in marked contrast to the degree of insight and rapport revealed on closer examination.

Suicidal tendencies are not as a rule common in derealization patients, but they may occur sometimes in the severer forms of the condition.

A rather different form of the syndrome is sometimes seen in patients in the involutional period of life. In this form, the unreality feelings are not nearly so marked, and are associated with a variety of bizarre somatic paraesthesias and hypochondriacal complaints, the thought disturbance being absent and the emotional reaction one of querulous anxiety. This type has, on the whole, a worse prognosis and is much less responsive to electroanoxia than the form just described.

The course of the untreated derealization-depersonalization syndrome is apt to be prolonged, usually of several months to a year or more. The ultimate prognosis, however, is generally good, as it tends to clear up completely in time, recurrence being uncommon, while personality deterioration of the schizophrenic type is never found.

As regards its nature and pathology, the derealization reaction may be regarded from the psychopathological point of view as a form of withdrawal from reality and a means of escape from an intolerable situation in a sensitive and intelligent personality. The unreality sensations would appear to be the expression of a subconscious renunciation by such a personality of the outer world and its realities which have become unbearable. It would seem that this does not involve such a radical personality upheaval as the typical schizophrenic reaction or such a profound degree of dissociation as in the latter condition.

From the organicist point of view the syndrome belongs to the dysoxic group of metabolic brain disorders, since it exhibits typically the dysoxic features of depression, slowing of cerebration, unpleasant mental and bodily sensations, and marked responsiveness to anoxic therapy with non-response to hypoglycaemia. It may be considered as a special form of dysoxic reaction in which the thalamic centres and their cortical connections are chiefly involved, particularly those systems which subserve the functions of conscious awareness and interpretation of somatic sensations and relation of the self to the external world. The higher association systems, acoustico-psychic and visuo-psychic areas, and frontal lobe motor systems are spared; hence the absence of features

such as disorder of association, aural and visual hallucinosis, and katatonic disturbances. The absence of mental deterioration would appear to indicate that the dysoxic process is of the reversible or benign type, as in the case of the depressive states.

Physiologically, the unreality state may occur in certain conditions of acute emotional crisis—for instance, acute grief reactions and ecstatic religious experiences in mystics and suggestible subjects. These conditions may be due to a temporary and reversible upset of the cerebral oxidation processes. Derealization feelings may also be found in states of severe physical exhaustion, due to overwork or physical stress, as in soldiers under battle conditions. A more severe form sometimes occurs as part of a post-infective exhaustion state.

Of specific toxins which produce a derealization syndrome, the best known are the dibenzopyran or cannabis drugs, and the phenylethylamine or mescaline compounds, of which the last-named was employed by Guttman and Maclay in their experiments on the therapy of derealization states.

In dosage of 0.1 to 0.2 gm. mescaline produces in the normal human subject a condition strikingly similar clinically to the derealization-depersonalization-syndrome. The symptoms include feelings of unreality as already described, slowness and difficulty in thinking with alterations in mental imagery, and peculiar sensations in the head. The affective reaction may be one of apathy and mild depression, but is more often one of euphoria, the only respect in which the intoxication differs from the endogenous syndrome. With this dosage, clouding of consciousness, hallucinosis, and other gross symptoms are not found, so that the condition induced is clinically almost identical with the derealization state seen in psychiatric patients.

It has been found by Quastel and others that the drug has a specific depressant effect on the oxidation mechanism of the brain cells, and this and the characteristic response of the endogenous unreality state to anoxic therapy would suggest that the physiological mechanism in this condition is similar to that of mescaline intoxication, that is to say, a disorder of the cellular oxidation processes. This, of course, does not necessarily mean that the endogenous syndrome is caused by the action of a toxic amine on the brain-cells; there is no clinical evidence to suggest that such toxins are present in the blood of derealization cases. It would rather appear that the pathological basis of the derealization syndrome is a metabolic upset of the cerebral oxidation processes occurring as a response to psychological or other stress in a constitutionally predisposed personality.

The differential diagnosis of the derealization-depersonalization state rests upon the characteristic association of symptoms already described, namely, unreality feelings, cephalic paraesthesia, affective disorder, thought disturbance, and favourable response to anoxia, with absence of hallucinosis and delusions, and good insight.

The commonest condition for which the syndrome is mistaken is the dysoxic form of schizophrenia. The distinguishing features of the true derealization state are the absence of the projection symptoms, disorder of language and thinking, and mental deterioration, with the presence of good rapport and insight. An important point is that the affective reaction of the derealization

syndrome is always appropriate, and shallowness, fatuity and incongruity of thought are never found.

It is distinguished from the acute depressive states by the absence of true psychomotor retardation, guilt ideas and delusions of unworthiness. As already pointed out, the typical depersonalization syndrome is not common in the involutional period.

In psychoneurotic conditions, feelings of unreality may sometimes occur, but they are, as a rule, not nearly so prominent as the other symptoms, and the characteristic combination of the five principal derealization features is not found in these conditions. Obsessional thoughts and actions or hysterical sensory and motor phenomena are, again, not symptoms characteristic of the depersonalization syndrome.

The severer depersonalization states on superficial examination often strongly suggest an acute confusional or stuporose katatonic state. In the former condition, however, clouding of consciousness and memory disorder are absent, as are also the other features commonly associated with confusional states, namely, hallucinosis, impaired comprehension, and habit disorders. Katatonic conditions may be distinguished by the presence of such features as motor rigidity, impulsiveness, negativism, and hallucinosis.

Of organic conditions, the only common one which might be mistaken for a severe derealization state is the Parkinsonian syndrome. In the more severe depersonalization reactions the apparent apathy, volitional poverty, lack of spontaneity, and facial expression may produce a clinical picture strongly resembling the post-encephalitic state. Careful neurological examination and the absence of true derealization symptoms in the last-named condition, however, should readily settle the diagnosis.

The response to drugs in the depersonalization syndrome is very characteristic. It is one of the most difficult of psychiatric conditions to influence with drugs of any type. Sedation and continuous narcosis are largely ineffective in alleviating the symptoms, while sympathetic stimulants of the benzedrine class either have no effect or render the patient tense and agitated without relieving either the depression or the unreality feelings. Powerful euphorants, such as mescaline and cannabis, are likewise either without effect or actually intensify the symptoms. In Guttman and Maclay's series of cases it was found that in the great majority of cases tested with the drug (mescaline), the feelings of depersonalization and depression were made worse. In a small number of patients, whose symptoms were mainly those of derealization rather than depersonalization, some improvement both in the power of visual imagery and the derealization feelings was apparent. On the whole, it would appear that drugs of this type have little or no practical applications in the treatment of this disorder.

Hypoglycaemic therapy is, on the whole, also ineffective in the derealization syndrome, as it is in the great majority of dysoxic states.

The treatment of choice in the depersonalization syndrome is electroanoxia. A course of six to seven applications administered twice weekly is often sufficient to effect a complete remission in the milder forms of the disorder. In severe cases, however, a total of ten to twelve treatments may be required.

Relapse, although by no means unknown, is much less frequent than with the katatonic and pure depressive states.

The secondary symptoms, such as sleeplessness and loss of appetite, may be relieved by the usual symptomatic measures, such as barbiturates in full doses at night and bitter tonics to promote appetite. Usually, however, these symptoms clear up rapidly on inception of anoxic therapy. Psychotherapeutic methods alone are of little avail in the active phase of the disease, but may be of value in the recovery stage when remission of the acute features has been effected by means of electroanoxia.

Residual symptoms usually include a slight degree of loss of concentration and impaired memory, mild spells of depression, and persistence in a very attenuated form of the unreality feelings. These may be treated by appropriate occupational and psychotherapy, and usually tend to resolve spontaneously in the course of a few weeks. In tense and anxious patients mild sedation, such as bromide in doses of 20 grains *t.d.s.*, or luminal, $\frac{1}{2}$ grain *t.d.s.*, is often of help; while for those in whom lack of energy and mild depression are the principal residua, benzedrine 10 mgm. twice daily usually gives relief.

SUMMARY.

1. The derealization-depersonalization syndrome and its clinical features are described.
2. Its relation to the dysoxic brain disorders and the mescaline encephalopathy is indicated.
3. The course, pathology, and treatment of the conditions are described.

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THE NATURE AND TREATMENT OF "WRITER'S CRAMP."

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WRITER'S cramp, *crampe des écrivains*, scrivener's palsy, graphospasm or mogigraphia may be defined as a condition of inco-ordination of the small muscles of the hand which appears only when attempting to write. The various names given to this condition emphasize that cramp or spasm is the predominant feature, and Osler thought that it was an early symptom. As the principal nerves and muscles are often intact and movements of a wider range can be carried out efficiently, the condition appears to be a functional disturbance of co-ordination.

Writer's cramp, was known in the days of quill pens, having been first described about 113 years ago by Sir Charles Bell, and an account of scrivener's palsy was published by Benedikt.

Among the ætiological factors, overwork and excessive use of the hand for writing has been stressed by more than one neurologist Janet (1903) however included the condition among the symptoms of "psychasthenia," of which he considered it to be a variety. Osler thought that it was due to a physiological disturbance of a localized area of the brain responsible for the movements involved in writing, and a somewhat similar view was held by Collier (1914), who stated that it was due either to a breakdown or to a disordered action of a part of the central nervous system, situated probably in the optic thalamus. He (1933) was emphatic that neurosis did not enter into the picture; that it was commoner in young people during training, and that the highly skilled workers were also liable to develop it under conditions of general ill-health, after excessive hours of work or on recommencing work at full pressure after ceasing work for a long period. According to him, personal idiosyncrasy, probably on account of some inherent weakness in the nervous mechanism, was more important than long years of occupation. Strümpell (1931) pointed out that this condition was often associated with a nervous constitution, and that neurasthenic symptoms were often present in persons suffering from writer's cramp. Pritchard (1937) says a "state of cramp" or disabling spasm is the primary condition, and that anxiety symptoms, if present, are secondary to the motor disability. Culpin (1931) was the first person in this country to point out that almost all the subjects of writer's cramp are suffering from psychoneurosis, and that it is common in persons suffering from nervous symptoms whose occupation does not involve much writing. Culpin, Farmer and Smith, who carried out an investigation on behalf of the Industrial Research Board (1927), came to the conclusion "that the commonest picture of a cramp subject was

the combination of severe psychoneurotic symptoms and poor muscular efficiency." Their research also demonstrated that cramp bears the same relation to other symptoms in the same patient as do such recognized psychoneurotic manifestations as stammer, tremors, and functional paralysis.

CLINICAL MATERIAL.

This paper is based on a study of 1,880 patients suffering from neuro-psychiatric symptoms admitted to my wards during the period 1941 to 1946. Prior to coming to us, some had been under treatment in general hospitals, but all had been examined by one or more senior psychiatrists, who had referred them for further investigations and treatment. These patients represented a fair cross-section of the general population, and before joining the Forces they came from various skilled, semi-skilled, and unskilled occupations, as well as from nearly all the learned professions; there were company directors, practising solicitors, school teachers, journalists, novelists, a bank manager, a bibliographer, a trainer of wild animals, and an "approved" candidate for Parliament! It was the routine practice of Mill Hill Emergency Hospital to ask each patient on arrival and before he was seen by a physician to answer in his own handwriting a simple questionnaire about his family, his personal history, his work record and his main symptoms. This practice was continued in the case of patients who were under my care in other hospitals. As these sheets were collected before the patients were interviewed, they had no reason to suspect that their handwriting *per se* was being studied. A scrutiny of these papers revealed that 171 patients had some disturbance of co-ordination, resulting in temporary changes in handwriting. The bibliographer, who had only a few days' service, and who claimed that before being conscripted he used to write for several hours daily, showed no changes in his handwriting at all.

The ages of these 171 patients ranged from 18 to 42, the average being 24.7, which is slightly higher than the average age of the 153 patients collected by Gowers, who found 52 in the age-group 10-20, and 50 in the group 20-30. Only 6 of our patients were clerks, whose duties involved much writing, while the remaining 165, or 97 per cent., were non-clerical workers whose occupations did not involve much writing. These persons could be considered in three groups: (1) Those suffering from acute anxiety, and whose "cramp," though bad enough to prevent them from writing much, was discovered accidentally as mentioned above. Many of them were too ill to write anything, and were not even aware of the temporary changes in their handwriting. A few had refrained from writing letters to their relatives, ostensibly for such reasons as that they could not concentrate or had headaches, or that their hands shook while writing. The majority of our patients were in this group. (2) Patients suffering from chronic and mild neurosis, whose predominant symptoms were connected with anomalies of motor functions. Some of these men complained of pain and stiffness in the hands, and a few used the word "cramp," and said that their attention had been drawn to the changes in their writing. (3) Persons suffering from organic diseases of the central nervous system. From a study of these patients, an attempt has been made in this paper to correlate the various clinical forms of "cramp" with the neuro-psychiatric conditions observed in

them, although a rigid separation of the illnesses into anxiety state, hysteria, depression and so on was found difficult and unprofitable, since nearly every patient had some features of each.

CLASSIFICATION OF "WRITER'S CRAMP."

Head (1910) classified writer's cramp into (1) primary or true, i.e., associated with the person's profession and therefore truly vocational in character, and (2) secondary, due to neuro-muscular weakness of the hand, unassociated with the person's profession. Gowers described a motor or spasmodic and a sensory or neuralgic form. There are obvious objections to each of these classifications. A useful classification appears to be: (1) Psychogenic—which manifests itself in three clinical forms, e.g., (a) the tremulous form, (b) the spastic form, and (c) the ataxic form. (2) Physiogenic, which causes the paretic or paralytic form. As cramp is not always found in these persons, the word "disturbance" seems to be more appropriate.

(1) *Psychogenic Writing Disturbance.*

(a) *The tremulous or wavy form of writing disturbance.*—Here the writing shows some characteristic features; it tends to become angular and the contours are less free and easy. Careful examination reveals minute waves, due to the fine tremor of the hand, and this wavy pattern persists even in apparent straight lines. In some cases, owing partly to faulty judgment and partly to clumsy execution, the point of the nib may be caught in the paper, causing much spluttering of ink, and in severe cases if the person persists in attempting to write, the paper may be perforated. In order to hide his disability the person may try to write in capital letters, but usually there are no irregularities either in the size of the letters or in the spacing between the lines.

The majority of persons in whom this form of writing disturbance was seen were suffering from neurosis with predominantly acute and severe anxiety, which is in line with the finding of Culpin (1924), that the cramp subject was more often of the anxiety than of the hysterical type. The anxiety was the result of severe stress, such as exposure to intense enemy action, unexpected and sudden awareness of marital infidelity, separation from home, etc., and in these patients it appeared as though there was a temporary disintegration of the personality patterns, causing numerous symptoms which could be described as stutter of various parts of the body. Some of the other concomitant symptoms were actual stutter, tremor of the limbs, frequency of and precipitate micturition (stutter of the bladder), frequent blinking, and nystagmus (Pai, 1944). Although a few complained of pain in the hand while writing, there was neither stiffness—unless tremor is considered as rigidity spread thin—nor cramp.

For the purpose of this paper it is not proposed to give statistical details of their previous histories, but suffice it to say that many admitted having suffered from neurotic symptoms in childhood, and some had previously broken down with nervous symptoms like stutter, enuresis, etc. All could be described as of the anxious and highly-strung type. When they were treated for the anxiety state, either by continuous narcosis or by heavy sedation for a week or two,

with modified insulin treatment in a few cases, there was general improvement in their condition, their somatic symptoms subsided, and their handwriting reverted to their previous patterns.

CASE 1.—Male, aged 33, admitted on 8.xi.44. He complained of trembling of body and limbs, severe stammer, frequency of micturition, inability to settle down in his unit, and intense dread of returning to army life; he described himself as a “bundle of nerves” since being called up eight weeks previously. There was a family history of alcoholism and psychopathy, and he had, in his childhood, suffered from general nervousness, numerous phobias and stammer. He had no friends, and did not play any games at school, where he was often bullied by his mates. After three or four deferments he was called up on Sept. 14, but almost immediately broke down with anxiety symptoms, and on the recommendation of a psychiatrist, was down-graded to B1. This did not improve his condition, and despite treatment, his stammer got worse and he suffered from constant body tremor, insomnia, and loss of weight. He was therefore again seen by the psychiatrist, who referred him to us. On examination he was an asthenic individual of poor physique who had obviously lost much weight. Though intelligent, he was apprehensive, very tremulous and mildly depressed. He complained of difficulty in writing, but after much coaxing was persuaded to write, which he did in capital letters. (See Fig. 1.)

AT..TRAINING..BUT...JUST..COULD..NO
 .CONSTANT..MISTAKES..AND..THEN...F!!
 BE HONEST AND SAY THAT CANNOT
 THINK OF DOING AWAY WITH MYSELF
 HAVING TO RETURN TO ARMY. FEEL
 PLEASE WANT YOU TO BELIEVE THAT
 HAVE ALWAYS WORRIED A LOT. JUST
 SINCERELY APPEAL TO YOU TO HELP

FIG. 1.

After heavy sedation, small doses of insulin (Pai, 1944), and discussion, his condition improved—he regained his lost weight, the tremor and stammer subsided and the temporary changes in his handwriting disappeared. On 18.xii.44 he was returned to his unit.

The changes in handwriting are dependent on the severity of the anxiety symptoms and not on the intensity of the stress responsible for the anxiety. This is well illustrated by the following case, whose breakdown was unconnected with the immediate stresses of war, such as exposure to bombardment, air-raids or mortar-fire.

CASE 2.—Aged 18½. Service, 1 week. Priority admission on 20.ix.46. The psychiatrist who referred him stated in the course of his letter: “. . . . He was not a good scholar and ‘always away from school because I was delicate and nervous.’ He was a cinema projectionist, but had to give it up because of “nerves” and shooting pains in the back of the head. He then had open-air jobs, such as milk roundsman. He began to have terrible headaches two or three days before call-up, and in the first week of army training collapsed and had to be brought to the M.I. Room on a stretcher. His mother is also very nervous. His parents are separated and he has been living with some mates’ parents. His symptoms are so severe that he requires early hospital therapy. . . .” On admission he complained of extreme nervousness,

shooting pains in the back of his head, tremor of body and limbs, nightmares, stutter, frequent blinking, pain in the eyes and insomnia. He admitted many neurotic symptoms in childhood, especially stammer, nightmares and enuresis, until the age of 12. He had always been a nail-biter, and persisted in this habit. On examination he was an asthenic youth of poor physique, who could hardly keep still on account of trembling from head to foot. He stuttered badly, blinked frequently, and exhibited fine tremor of outstretched hands, with palmar sweating. He was anxious, apprehensive and lachrymose, and at first refused all treatment, saying that

"How did these develop? I am not
 any, because the N.C.O.'s
 and they put on me, my
 gun of me, I have always
 fairly, when I talk to officers
 get my words out, I stutter
 miserably and depressed."

FIG. 2.

sleeping very well, and I don't
 dream, and no headaches, I
 How did these develop? Some to
 I am eating very much better
 like going out for a walk
 rest and treatment has done
 good. I would like to see me

FIG. 3.

he dreaded taking medicines, or even remaining in bed for the purpose of deep narcosis.

In order to establish rapport it was necessary to convince him that his symptoms could be removed. Under hypnotic suggestion the blinking became less frequent, and this induced him to accept further treatment. With four days' rest in bed and prolonged narcosis all his symptoms subsided, the tremor and stammer disappeared and his writing reverted to its former pattern. Fig. 2 is a specimen of his writing on admission, and Fig. 3 after four days of sedation. The letters "b" and "f" show the changes well.

Various tests which depend on muscle co-ordination and equilibration have been suggested by Robins (1946) for spotting anxiety neurosis. Although there are no short cuts in psychiatric practice, for those who prefer "tips," the above-mentioned change in handwriting, when present, is a useful index of the severity of the anxiety state and is also helpful in assessing progress. It is also a simple test for differentiating hysterical tremor of outstretched hands from tremor due to anxiety, as in the former condition no such calligraphic changes (wavy pattern) are usually observed.

(b) *The spastic form or genuine cramp.*—In this variety the writing tends to be smaller but the letters are distinctly legible. It is uncommon to find spluttering of ink or perforation of paper, as the nib is unlikely to be caught in the paper. The main objective features depend on whether the spasm or "cramp" is confined to the thenar and the interossei muscles which grip the pen, or whether it also involves the flexor muscles of the fingers which move the hand when writing. The extent and severity of the spasm and the corresponding difficulty in relaxation vary in different persons. In mild cases there may be subjective feelings of stiffness, accompanied by fatigue and inability to write more than a few lines. In moderate cases the spasm of the muscles gives the impression that the pen is clutched too tightly, and delay in lifting the fingers causes the writing to become slow, laboured and smaller. Occasionally, owing to tonic contraction, the person might not be able to write at all. In one of our patients the spasm was so severe as to cause locking: whenever he attempted to write, the pen was jerked aside with some force by the extreme flexion and adduction of the right thumb and the contraction of the other fingers over it, which resulted in a tightly clenched fist—a condition somewhat similar to the "lock-spasm" described by Weir Mitchell. One of Culpin's patients is said to have broken the pencil in an attempt to write, and similar severe cases have been reported by other physicians. In order to overcome this disability, the sufferer often employs various devices and tricks to grip the pen in grotesque ways. Sometimes he supports the right wrist with the left hand, or firmly presses the wrist on the table and moves the paper with the left hand. In some patients the unequal spasm of opposing groups of muscles causes the pen to be slowly rotated so that they write with the edge of the nib.

All the patients in whom this form of writing disturbance was found were suffering from predominantly hysterical reactions, and they belonged to the shy, diffident, timid type, as opposed to the anxious and highly-strung type of the previous group. In the case of some there was a history of spasmogenic (Houston, 1929) traits in childhood—instead of stammer they suffered from tongue-tiedness when exposed to stress. Every one complained of numerous symptoms and general fatigue, but the signs of anxiety, such as fine tremor of outstretched hands, palmar sweating, frequency of micturition, stammer and nystagmus were absent. The spastic form is probably commoner in persons with spasmogenic tendencies.

In view of the long duration of their complaints and the predominantly hysterical reactions the successful treatment of these patients is not easy. Heavy sedation, with or without insulin treatment, may not achieve any tangible results, as these persons do not complain either of insomnia or of loss

... losing control of myself, as regards temper and
 thought: strangely conscious of heart-beat, and nervous
 heat, it even that excites my forehead: nasal catarrh:
 silent exertion: nothing in ear-drums resort going to sleep...
 ... through working indefinite hours, morning, night...

FIG. 4

When behaviour now analogous to that
 rage and fear when its phantasies of omnipotence and
 (internal and external) and the good and objects in it
 reality: then it cries, shudders and screams with anger
 that it cannot have the complete control it desires and
 fly asleep from which it wakes with complete forgetfulness
 past.

(1)

FIG. 5 (1).

When behaviour now analogous to that
 by rage and fear when its phantasies of omnipotence and co-
 (internal and external) and the good and objects in it,
 reality: then it cries, shudders and screams with anguish
 that it cannot have the complete control it desires and
 fly asleep from which it wakes with complete forgetfulness

(2)

FIG. 5 (2)

of weight. To be really effective, treatment should aim at (a) the removal of any underlying conflict by the usual psychiatric methods such as hypnosis, analysis, ether-abreaction or narco-analysis, together with psychiatric social work

Then behaviour is analogous to that of
 a baby and fear when its fantasies of conflict
 are internal and external and a good object is
 reality; then it cries, shudders and screams with
 realisation that it cannot have complete control
 and is calmed by sleep from which is
 forgetfulness, for it has no past.

(3)

FIG. 5 (3).

... strong control of myself as regards
 temper and thought; ... strangely conscious
 reaction in fingers; ... some peculiar hand
 ... rapid ... perspiration on skin at
 ... the ... action; ... watching in
 ... sleep
 ... working ... indefinite ... hours and ...

FIG. 5 (4).

and so on; (b) relief of spasm by hypnosis or by giving barbiturates intravenously; and (c) prevention of habit formation by repeated hypnotic suggestions and daily supervision and correction of handwriting. Both for producing rapid relaxation and for making repeated suggestions, hypnosis is the method of choice and gives excellent results.

CASE 3.—Aged 21. Admitted on 22.x.44. The Army Psychiatrist who referred him, stated: "His O.C. says that he is frequently absent from duty on account of ill-health. His M.O. states that this man alleges that he has been previously seen by a psychiatrist. . . . He states that he cannot control his fingers and he gets dizziness. When walking along a road he is inclined to have the feeling of falling to the left, although this is occasionally transferred to the right; the houses appear to move up and down. . . . He has always been shy and self-conscious. He then states he has queer fits of depression, which are becoming more frequent. During these attacks everything is futile and he loses all interest in life and in his surroundings. . . ." His history showed that after matriculating he began training as a fitter, but gave it up after a few weeks because he found it too heavy. He then stayed at home and helped in the kitchen. In September, 1942, he began to complain of feeling tired, pain and cramps in the legs and pain (? cramp) in the chest. About July, 1943, he was called up, but began to report sick, complaining of cramps, undue fatigue and pains in the chest, for which there was no obvious physical cause. He was therefore down-graded to Cat. C2 (Home Service only). In 1944 he began to complain that he could not control his fingers, that he had cramp in his hands, and that his handwriting was getting smaller. O.E. he was a slim, asthenic youth who, according to the intelligence tests, was of superior intelligence (Grade I). While writing it seemed as though his right hand was glued to the paper, and on account of the spasm of the flexor muscles there was difficulty in lifting the thumb and forefinger; the excursions of the pen were very restricted, the writing was slow and the letters very small. It was not surprising that despite his good education and high intelligence, the Army could not make much use of him even for Home Service. He was treated by sedation and was also given barbiturates intravenously, without any benefit. When he was made to write with a pen inserted through a cotton reel the writing became slightly larger but there was no quickening in the tempo, which continued to be very slow indeed. As soon as he discarded the cotton reel and attempted to write with an ordinary pen the writing became smaller again. When he was given daily hypnotic suggestions for five days there was gradual and progressive relaxation of the muscles, the movements of the fingers became free, the excursions wide and the letters increasingly larger in size. In order to test the results of treatment he was given clerical work in the psychological department of the hospital, where he worked hard for several hours daily without showing any tendency to relapse, and he also took part in organized physical training and games. Some of his emotional problems were straightened out. He maintained this improvement and also gained in weight without any insulin therapy. He was returned to his Unit, where he was afterwards reported to be working efficiently. Fig. 4 shows his writing on admission, and Fig. 5 (1), (2), (3), (4) shows the results after hypnotic suggestions given on successive days.

(c) *The ataxic or jerky form.*—Here the writing is characterized by irregularities in shape and size of letters, as well as inequalities in the spacing between the lines, which may diverge towards the right side. Owing to excessive contraction of the *extensor muscles* the fingers are lifted too high, the movements are erratic and jerky, and the excursions wide and irregular, giving the impression of uncontrolled execution. It is quite possible that a person's inability to keep his fingers firmly on the pen might be due not only to excessive contraction of the extensor muscles, but also to a primary weakness of the will to write and a secondary lack of confidence in the ability to write. Persons in whom this form was seen were also suffering from predominantly hysterical reactions. These patients derive benefit from active exercise of the flexor muscles, which is best carried out by asking them to take part in organized physical training and games. Massage and exercises should not be carried out in a physiotherapy department, as such a procedure will fix the person's attention on his disability, and might lead him to think that something is structurally wrong with the parts concerned.

CASE 4.—Aged 35. Service, 1 year. Referred on account of constant dull ache in right arm with acute pain whenever he has to use it, inability to write on account of "cramp" and shortness of breath on exertion. He admitted numerous neurotic symptoms in childhood. After attending a secondary school he studied architecture for a while, and then without completing the course began to work as an architect, earning £7 per week. On account of his work his call-up was postponed twice, but in February, 1944, he was conscripted into the Army, where he soon passed the Army Architectural Draughtsman's course. He was, however, not mustered as a draughtsman, and was employed on non-clerical duties, which he intensely disliked. About June he began to complain of fatigue and pain in the right arm and hand,

With the first sight of the
Taj Mahal there come only a sense
of undefinable pleasure. It is no mere
feeling of admiration, still less of
amazement, no mere delight in a
splendid building because it does not
impress one as a building. There is
a sudden ~~re~~ vision, and with it a sudden
of ineffable satisfaction, as if in the
place of a Marble Dome the Garden had
been filled with divine music.

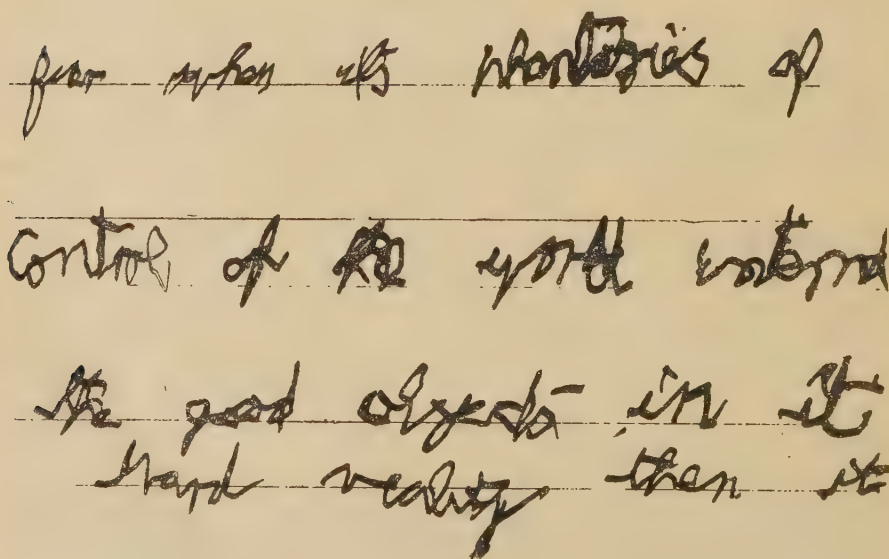
FIG. 6.

and four months later he was admitted to a hospital, where he was treated for "tennis elbow," but without any relief. While still in the hospital he was then examined by a psychiatrist, who correctly diagnosed his trouble as hysteria and referred him to us. On admission he stated that he had practically done no duties for nearly seven months. He was very disgruntled and full of grievances against the Army, because he felt that he had been neither selected for a commission nor paid as a draughtsman. Fig. 6 is a specimen of his writing obtained after a good deal of persuasion and encouragement. It would be seen that there is a gradual improvement in the writing, and the lowest line almost conforms to his previous pattern, indicating that the flexors were beginning to contract efficiently and harmoniously. Under hypno-analysis it was discovered that his symptoms

developed at a time when his officers were discussing the question of employing him on clerical duties in the Company office, but still without giving him the trade rate of pay authorized for a draughtsman. As soon as his symptoms subsided, as a result of hypnotic suggestions and physical training, he was returned to his Unit with a recommendation to employ him on duties commensurate with his education and capacities.

(2) *Physiogenic Writing Disturbances.*

Among the various organic causes responsible for a condition identical with "writer's cramp" may be mentioned chorea, disseminated sclerosis, paralysis agitans, parkinsonism, progressive muscular atrophy and post-vaccinal encephalomyelitis. In chronic conditions the inco-ordination and disturbances in writing are not so well marked as in diseases of sudden onset and rapid progress. The clinical condition may be called the "paralytic form" of writing disturbance. Owing to the paralysis and weakness of the muscles of the hand, writing becomes a great painful effort and is very tiring. The letters, which are difficult to recognize, are large and irregular in outline with sharp corners and right angles. In this indistinct and rugged scribbling, arcs, contours and semicircles are conspicuous by their absence or are often expressed as straight lines and angles. By emphasising the essentials and simplifying form a tendency to stylization (Kretschmer, 1934) may be found. Sometimes the words look like the Bakäiri figures on the rind of a gourd (Wundt, 1913), the whole writing resembling the very early efforts of a child learning to write for the first time.



for when it's fantasies of
control of the world instead
the good objects in it
hard reality then it

FIG. 7.

CASE 5.—Aged 18 years. Service, 3 months. Referred with a note: " . . . Dull, slow in learning, fails to understand orders. Complains of loss of power in arms and legs. Constantly falling down." On admission he had difficulty in talking, and his speech was slurred. He complained of difficulty in swallowing both solids and liquids, numbness of right side of face, weakness of legs, inability to stand or

walk—duration, 3 weeks. Slurred speech of two weeks' duration and double vision of one week's duration. O.E. he had extensive physical signs of lesions in the C.N.S. compatible with a diagnosis of acute post-vaccinal encephalomyelitis. He was therefore transferred to a special neurological hospital, where he died six weeks later. Fig. 7 is a specimen of his handwriting.

The changes in handwriting seen in patients suffering from various psychotic conditions, such as G.P.I., schizophrenia, manic-depression and so on, are outside the scope of this article.

DISCUSSION.

The importance of this subject lies in the fact that "writer's cramp" has been included among the Dangerous Trades for the purpose of the Workmen's Compensation Act. In America and France, where employers are not bound to pay compensation to workers suffering from this disability, its incidence is almost negligible. In Italy it has not received much notice even in the medical literature (Morselli, 1921; Binswanger and Siemerling, 1927; Fumarola and Mòglie, 1936). Although this condition is supposed to occur only among those whose occupation involves much writing, this study confirms Culpin's observation that it also occurs in persons suffering from neurosis, whose work does not involve much writing—in other words, the so-called "writer's cramp," instead of being an occupational disease, appears to be only a symptom of neurosis. From the above case-histories it would also be seen that in our patients the "cramp" developed, not after excessive hours of writing, but when they were faced with the prospect of being employed (without suitable remuneration) on duties involving much writing. The term "writer's cramp" would appear to be a misnomer, as in the first place the condition is commoner in non-professional writers, and secondly, cramp or spasm is not found in all persons complaining of this symptom. "Writing disturbance" is a suitable and more accurate term, as it describes the symptom without giving any indication of the ætiology.

As regards treatment, those physicians who have postulated a physiological basis for this symptom have prescribed prolonged rest and complete abstention from writing for periods which have varied from a few weeks to nine or more months (Jelliffe, 1935; Sadler, 1936; Saunders, 1940). Walshe recommends complete rest from writing for six months. French neuro-psychiatrists who, like Culpin, have emphasized the part played by psychological stress in the production of this symptom, have advocated methods which could be summed up in Janet's admirable words: "Education, excitation and guidance." They claim good results from a system of gymnastics (Kouindjy, 1906), combined with educational treatment as suggested by Montarani (1909). Even when the affected muscles are unaltered in shape and size massage appears to be beneficial, although the exact mechanism of its action is not understood (Gilles de la Tourette, 1899). Breathing exercises as recommended by Pitres (1901), have also been found useful. But the object of all these methods can equally well be attained by organized physical training, team games, group discussions and educational therapy facilities, available at any modern psychiatric hospital. Every person complaining of "cramp" for which there is no organic cause should be considered as a psychiatric patient and treated accordingly. Hypnotic

suggestion, which has been successfully used for the removal of numerous symptoms (Bernheim, 1886; Sidis, 1911), might be used as a therapeutic measure in the case of persons showing hysterical reactions.

SUMMARY.

- (1) 171 out of 1,880 (or approximately 1 in 11) patients suffering from neuro-psychiatric conditions showed some inco-ordination of the muscles of the hand resulting in writing disturbances.
- (2) Those in whom the tremulous form of writing was found were suffering from acute and severe anxiety neurosis.
- (3) Those in whom the spastic or cramped form of writing was found, as well as those who showed the ataxic or jerky form of writing, were suffering from neurosis with marked hysterical reactions.
- (4) Those who showed the paralytic form of disturbance, characterized by slovenly and almost illegible writing, were suffering from organic diseases of the central nervous system.
- (5) The term "writing disturbance" has been suggested instead of the name "writer's cramp," which appears to be a misnomer.

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INTELLIGENCE OF MALE NON-INSTITUTIONALIZED EPILEPTICS OF MILITARY AGE.

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THE intelligence of epileptics has been studied by many investigators. Some of these studies were confined to children, some to patients in institutions, others to out-patients and a few to private patients. Some studies included institutionalized and non-institutionalized patients with no effort made to consider the two groups separately. The out-patient material was assumed to represent the best cross section of epileptics, but as Somerfeld-Ziskind and Ziskind (1) point out, patients who are not helped by the treatment tend to stop attending clinics. This bias in the material is reflected in the wide variations of the results; for example there is a range in the reported mean I.Q.s. of from 113.5 to 78. There appeared to be a definite need for a study based on a wider group, representing all types of epileptics. Examination of whole sections of the population, carried out during the recent war, afford a unique opportunity for this study, for the group was absolute, and there were no selective factors except sex, age and institutionalization.

This study is based on data derived from the administration of the Canadian Army Intelligence Test (Revised examination M) to call-ups and recruits. The only epileptics of Army age not examined were married men between the ages of 30 and 40 who did not seek to enlist. All other non-institutionalized male epileptics between the ages of 18 and 40, and those up to the age of 45 who enlisted, were examined. Complete records were not kept in the early days of the war, and these records date from the middle of 1942. However, physical standards were revised at about that time, prior medical rejections were not valid, and all those previously rejected or discharged were subject to call-up. It is felt that this material represents a good absolute sample of non-institutionalized male epileptics of military age in one military district. With few exceptions, all men in Canada are discharged in the military district in which they enlisted, and so cases of men accepted and later discharged for epilepsy were readily available.

Military District No. 2 in Canada consists of roughly the middle third of the Province of Ontario. In the south it is highly industrialized and thickly populated, with two large cities, Toronto and Hamilton. Towards the north a section of rich agricultural land is followed by sparsely settled timber and mining country. The exact ratio of rural to urban population could not be obtained, but 13 per cent. of the male enlistments were rural.

Four hundred and eighty epileptics were seen in Military District No. 2. Complete data was not available on all, and the type of epilepsy, except for

"idiopathic," was not stated. For some, only total "M" scores and age, and for some, age alone, were available. However, complete data was available for 20 men who took the French Form A, 123 who took the English Form A, and 226 who took the English Form B.

The average age was 22 and the distribution of ages as follows :

15-19	.	.	.	.	88 cases
20-24	.	..	.	.	135 "
25-29	.	.	.	.	125 "
30-34	.	.	.	.	61 "
35-39	.	.	.	.	20 "
40-44	.	.	.	.	6 "

Controls were obtained by random sampling of all personnel tested throughout Canada at one particular time. Precautions were taken, and it is felt that the samples of the various "M" test forms were equivalent within the limits of the experimental error. The call-up of men was a matter of local policy within the military district, and the inclusion of all of Canada at the same time tended to control special local factors, such as age and occupation, which might be more weighted in one district than another. The average total "M" test score in Military District No. 2 is higher than that for the whole country, and Major K. A. M. Macintyre, statistician for the Directorate of Personnel selection feels that it is safe to assume that a control group restricted to the Military District would have an average total score at least 5 points higher than the national one. Two thousand five hundred and ninety-six took the English Form A, 2,552 the English Form B, and 1,884 the French Form A.

The revised examination "M" is administered to groups not usually exceeding 50, generally about 30, depending on the volume of men to be examined. It consists of eight subtests in the following order: Picture completion, pictorial absurdities, figure construction, tool recognition, mechanical information, arithmetic, vocabulary and verbal analogies. The maximum total score is 211. Form A was administered until the summer of 1943, after which Form B was used. In Military District No. 2 only one French test, Form A, was used. Because of the small number in the series the results of the French test are not given. In general they corroborated the conclusions obtained from the English tests.

RESULTS.

The average "M" scores of the epileptics and controls were compared both for the totals and for the individual subtests. The total or global "M" score average was :

Control.

Epileptic.

English Form A	.	124'3	S.D. 39'5	.	110'9	S.D. 39'9 (133 cases).
English Form B	.	126'4	S.D. 40'3	.	120'1	S.D. 36'2 (237 ").

The difference was found to be statistically significant for Form A only, but when "t" values were combined and equated for the differences in numbers, a statistically significant value of 3.92 was obtained. This combined with the special factor of higher total "M" scores in Military District No. 2, would

indicate that the difference was significant. Frequency distribution curves of total "M" scores showed no marked skewing to indicate increased incidence of epilepsy in any particular portion of the population. The epileptic curve was shifted to the left and somewhat flattened, indicating a generalized lowering of intellectual capacity. Table 1 shows the percentage of the epileptic and control population in the quarters of the total "M" score, and it can be seen that the epileptic group shows a slightly increased percentage in the lower three-quarters, and 7.7 and 6.8 per cent. less respectively in the upper quarter of test Forms A and B.

The mean scores for each subject were calculated and compared for statistical significance. The method used was that given by Fisher (2) "A method of comparing two means." It can be seen that the epileptics did significantly worse in Tests 3 and 8 in both Forms A and B, and worse in Test 1 in Form B.

Because of the significantly lower mean total score of epileptics, an attempt was made to see how the factor of lower intelligence contributed to the "profile." One hundred literate recruits graded as "intelligence insufficient to absorb full military training," selected at random in the same district, were studied in the same manner as above. Because of the weight given to illiteracy in down-grading for "intelligence," it was felt that a purer sample of mental defectives would be obtained in the literate groups and would not materially affect the profile. All were tested with English Form B. These results are also given in Table I. Tests 8 and 1 seem much below the general level of attainment, while better results were obtained in Tests 2 and 3 than in Tests 6 and 7. In view of this finding, the poor performance by the epileptics in Test 8 as compared to Test 7, two tests which ordinarily have a high co-efficient of correlation, is regarded as a reflection of poorer intelligence. The poor performance in Test 3 does not seem to be a function of poor intelligence.

DISCUSSION.

This study might be criticized on the grounds that the diagnosis was established quickly, without, in many cases, verification from other sources, and that the man's word played too great a part in the diagnosis. All cases had been thoroughly examined before they reached the psychiatrist, and all cases of epilepsy were tested for abnormalities of reflexes, motor power and co-ordination. If there was any cause for suspicion that the fits were secondary, skull plates were taken, and a more detailed neurological examination was done. Occasionally the diagnosis was deferred until an electro-encephalogram was obtained. It should be borne in mind that 135 of these cases were serving soldiers whose fits were witnessed by others. A factor which tended to operate in favour of accurate diagnosis was the "accept for recheck" system which was in force in the Canadian Army until Feb., 1945. Men who had complaints, and in whom a definite diagnosis could not be made, were accepted for recheck and seen by a psychiatrist after a trial of training. In this way it was found that the standards for epilepsy were not too strict. These standards agree with those laid down by Roseman (3) as the semi-official attitude in the U.S. Army.

TABLE I.—*Statistical Data.*

Test.	Form A.			Form B.			Defective.		
	D.	Z.	t.	P.	D.	Z.	t.	D.	t.
1	— .51	— .1399	1.52	Less than .2	— 1.16	— .364	5.24	— 5.10	24.03
2	— .2	— .0505	.55	” .6	— .46	— .1179	1.70	— 3.9	10.05
3	— .87	— .188	2.04	” .05	— 1.02	— .2162	3.12	— 4.77	10.18
4	— .81	— .13501	.46	” .2	— 1.04	— .1550	2.23	— 9.06	36.71
5	— .8	— .09721	.05	” .3	— .91	— .1112	1.60	— 13.67	16.95
6	— .34	— .0892	.97	” .4	— .63	— .1708	2.46	— 5.04	13.84
7	— .61	— .0849	.92	” .4	— .04	— .0058	.08	— 8.18	12.03
8	— 1.83	— .21792	.36	” .02	— 1.47	— .2268	3.27	— 14.32	23.22

D = Difference between control and epileptic scores.

Z = Standard score (the difference divided by the standard deviation).

t = Fisher's "t" value.

P = Probability that the difference is due to chance (less than .05 is statistically significant).

Lennox (4) has stated that about .5 per cent. of the population suffers from fits; .62 per cent. (5) was found to be the incidence in Nassau County, New York. In the last war the incidence of epilepsy in the U.S.A. among drafted men was .51 per cent. (6), and in Scotland among Army recruits from 1917 to 1919, .64 per cent. The incidence of rejections for epilepsy among Selective Service registrants in World War II in the U.S.A. is .51 per cent. (7). In Military District No. 2 .39 per cent. of the men examined were rejected for epilepsy, a somewhat lower incidence than in the U.S.A. These figures would indicate that our standards were not too high. The number of institutionalized male epileptics of military age from the District was calculated, and while this number must at the very best be a rough guess, it raised the incidence of epilepsy in the total male population to .55 per cent., a figure that coincides with that of Lennox (4) for epilepsy in the general population and which has been generally accepted. The incidence of non-institutionalized epileptics will vary according to the facilities and ease of commitment in the area.

Somerfeld-Ziskind and Ziskind (1) tested 100 epileptic out-patients and found a mean I.Q. of 93 and a range of 39 to 153. They stated that an I.Q. of 100 is normal for the whole community. Memory retention and language ability were somewhat defective. Barnes and Fetterman (8) studied 105 out-patients and found a mean I.Q. of 79 and a range of 35 to 130. Collins, Atwell and Moore (9) reported the results of Stanford-Binet tests in 220 epileptic patients at the Boston Psychopathic Hospital and found I.Qs. of 26 to 130 with the median at 78, using the standard for the I.Q. at the 14-year level. Arluck (10) reported on 16 epileptic out-patients at the Mt. Sinai Hospital, New York, N.Y., and found a mean I.Q. of 113.5, with a range of 68 to 144. Results of the picture absurdity test were significantly worse in epileptics than in control groups. Rubisoff (11) reported a group of 66 institutionalized epileptics, in which she found a mean I.Q. of 75, which she stated was not significantly lower than that found for non-institutionalized groups. Lennox and Collins (12) tested a group of 186 twins. Sixty-three twins were without a history of epilepsy or brain injury, and 30 had a history of seizures. The average I.Q. for the 149 non-epileptic persons was 108. For the 29 persons with epilepsy, but without definite evidence of brain injury it was 96, and for the 10 epileptics with brain injury, 77. Either the Wechsler-Bellevue or the Stanford-Binet Form L tests were used. The subjects who were given the Wechsler-Bellevue tests did relatively poorly in the performance tests.

The above figures indicate the variability of the intelligence levels obtained by different investigators. Even out-patient departments vary a great deal, sometimes in the same cities, in the type of patient, particularly with regard to his social, economic and ethnocultural background, and this tends to select the material. Our own material would indicate that the intelligence of the non-institutionalized epileptic in Military District No. 2 in Canada is on the average only slightly inferior to that of the general population. The incidence of recruits graded "intelligence insufficient to absorb full military training" from May, 1943, to December, 1944, was 7.29 per cent. In that same period the incidence of this category among the epileptics was 8.94 per cent. Using Chi Square Test a value of 1.05 was found, indicating that the difference in

incidence was not statistically significant. It would appear then that the difference in intellectual level of the epileptics and the general population is only slight, and is not reflected in an increased number of mental defectives. In a previous study (13) the close relationship between convulsive disorder and mental deficiency in an institutionalized group of patients was indicated. This is also stated in a study by Lennox (14). The explanation of this lack of relationship in the present group is that in Military District No. 2 most of the defective epileptics are institutionalized by the time they reach military age. Our group also seemed to show distinctively poor performance in the figure construction test. In common with Arluck's group, they also did more poorly in the picture completion than in the other tests, but in this study this is also true for the defective group. In general the difference in performance of epileptics and control groups in the various subtests as reported in the literature are not consistent and apply to many different abilities. Wallin (15) has stated that they are not significant—"accordingly, the epileptic is not abnormal in respect to these traits in the sense that he constitutes a distinct type"

SUMMARY AND CONCLUSIONS.

1. The intelligence of the non-institutionalized epileptics of military age (approx. 18 to 40) was tested by the Canadian Army Revised Examination "M."

2. It was found that their intelligence was only slightly lower than that of the general population, but significantly so. This lower intelligence was not reflected in an increase of mental defectives (defined by the standard, "intelligence insufficient to absorb full military training"). When the factor of lower intelligence level was discounted, it appeared that the epileptics did relatively poorly on the figure configuration test. In view of other findings in the literature this was not considered very significant.

3. The incidence of non-institutionalized male epileptics of military age in Military District No. 2 is 39 per cent.

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INTENSIVE ELECTRICAL CONVULSION THERAPY IN ACUTE MANIA.

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It would seem that the overwhelming success of convulsion therapy in depressive syndromes has retarded recognition of the use of this treatment in states of excitement. Little has been written in this country on E.C.T. in mania, and apart from a report that the condition is refractory and frequently relapses, there is scant guidance on the subject. The object of this paper is to draw attention to the real value of E.C.T. in mania, when given in adequate quantity at the beginning, and followed up by frequent spacing of shocks to prevent relapse. For this purpose, "intensive therapy" is regarded as that which commences with several shocks daily until the excited state is suppressed, and by this method the most maniacal patient can be rapidly and dramatically brought under control.

There is nothing more disturbing in a psychiatric ward than the arrival of a patient in a state of wild excitement. Such a case tests the skill and patience of the nursing staff, and unsettles the other patients. Fortunately, these episodes are not common. Nevertheless, one feels the necessity for immediate action, as with an emergency, but all too frequently the result of the administration of narcotics is a few hours of peace between the outbursts of noisy excitement until the patient's frenzy has spent itself over a period of days or weeks.

Text-books are usually brief in dealing with the treatment of mania, and have not added much to the observations of Kraepelin (1906) that 12 to 16 grammes of sodium bromide daily might cut short a mild attack, but that stronger sedation combined with prolonged warm baths are necessary for the more severe cases. Prolonged narcosis combined with insulin has proved effective, but there is a need for rapid positive control in acute cases.

It is, perhaps, not so surprising to find a degree of reluctance to use E.C.T. in mania, for apart from the active resistance of the patient, there is probably a feeling that the apparent stimulative effect of a convulsion in melancholic and schizophrenic stupors must make it inappropriate for the excited patient. And certainly, the first treatment may appear to make the manic patient worse or, at any rate, have little beneficial effect. But it seems that we have in E.C.T. a therapeutic agent which can be used quantitatively with fine discrimination.

In maniacal states it is necessary to push E.C.T. to the stage where mental confusion is produced, and for this purpose treatments should be given at least once daily to begin with. The risk of producing irreversible brain damage or dysrhythmia is questionable, and has not been proved.

One must weigh in the balance the possible harmful sequelae of treatment

with the harmful effects of the disease process if allowed to continue. On both sides there is a possibility of intellectual impairment, but in E.C.T. the memory changes are transitory. Perlson (1945) reports an investigation in a male schizophrenic aged 27, who recovered after receiving 248 shock treatments, with no evidences of intellectual impairment.

Apart from the so-called maintenance treatment of the chronic psychotic described by Moore (1943) and Caplan (1946), in which E.C.T. may be regarded as extensive rather than intensive, "confusional treatment" has been advocated by relatively few psychiatrists. C. H. Neyman (1944) places great stress on mental confusion as the therapeutic agent in states of excitement, and advises daily, or several times daily treatments in severe psychoses, until complete disorientation is produced. He states that no matter how great the excitement, this will, of necessity, cease under E.C.T.

Kalinowsky (1943) has always emphasized the importance of adequate treatment, and in his recent book (1946) he advises E.C.T. 2 to 3 times daily in states of acute excitement. Berger (1946), reporting on Japanese military psychiatry in Korea, found that in general, excited patients were given convulsions 2 to 3 times daily, while "gentle" patients received 2 to 3 shocks weekly. Fernandes and Polonio (1946) found induced convulsions to be life-saving in "delirium acutum" and "acute fatal catatonia," which is often accompanied by pyrexia, tachycardia, leucocytosis and increased blood urea. They state that advanced cases respond dramatically to 1 or 2 fits daily for 2 or 3 days, and they remark that death is likely to occur more by under-treatment than by an excess. Of passing interest is the use made by Milligan (1946) of intensive E.C.T. in the intractable neurotic states.

We emphasized in a previous paper (Kino and Thorpe, 1946) that the effective use of E.C.T. requires individual adaptation to each case, and in general should be prolonged in schizophrenia, and intensive in mania. We mentioned that good results were achieved in mania by giving daily treatments, or even 6 to 8 treatments over a period of two days. In the present paper we wish to elaborate upon the latter statement.

The aim of E.C.T. in mania is the production of a degree of mental confusion just sufficient to suppress the abnormal level of psycho-motor activity, the intensity of treatment being in direct proportion to the degree of excitement. In milder cases it is sufficient to begin with one convulsion each day, but in the more acute states only multiple shocks for the first few days will calm the patient, leaving him with a transitory retrograde amnesia.

After the first treatment, the acute case quickly reverts to the previous state of excitement. Another convulsion is then given one to two hours after the first, and repeated at increasing intervals until it is judged that the degree of excitement has been definitely reduced. This may necessitate the administration of 3 to 6 treatments during the first day, at the end of which the patient usually complains of headache, but sleeps well during the night with the help of a sedative.

The treatment is continued on the second day with a reduced number of shocks, and on successive days is gradually tapered off to once daily, alternate daily, twice and once weekly, according to patient's condition, and tendency to relapse. There seems to be little danger in giving multiple shocks provided

sufficient time is given for return of normal pulse and respiration, and for the patient to begin to regain consciousness (Sogliani, 1939). This we can confirm from our experience, even in patients on the verge of physical exhaustion from maniacal excitement.

A typical spacing of 24 treatments could be represented by the formula 32III . . (24), where the figure in brackets indicates the total number of treatments, including those required at longer than daily intervals to maintain the patient in a quiet state. The complete course of treatment can be divided into three phases, the first phase, lasting two to four days, during which period the mental excitement is suppressed by multiple shocks; the second phase, extending over a period of four to 8 weeks, when maintenance of control will depend upon a judicious spacing of treatments; and a third phase of convalescence and rehabilitation, with cessation of shocks, and preparation for discharge home.

Often on the second or third day of treatment the patient will be found quietly eating a meal, or looking at a book, and conversation will be orderly and rational. Questioning will usually elicit the reply, "Where am I? What am I doing here?" and a retrograde amnesia will be found extending for a considerable period before the illness. The quiet co-operation of the patient will be appreciated by the nursing staff.

For the first few days after return to orderly mental functioning the patient is concerned with reorientation to recent events, and will welcome simple explanations and reassurance. The amnesia gradually recedes during the ensuing weeks. If the spacing of treatments is too long during this second phase a mild relapse of excitement may occur, which can usually be quickly brought under control by a temporary intensification of the treatment. A manic-depressive, on the other hand, may pass over to a period of depression. Many patients, however, show progressive improvement, to eventual recovery in two or three months' time. There is no evidence that this treatment has any influence on the tendency to second attacks.

The usual contra-indications to E.C.T. should be carefully considered, and one should be cautious in the early puerperal mania with its danger of pelvic thrombosis; but in our experience over a period of six years, during which some 20 cases have been given intensive treatment, all have tolerated it well. There have been no untoward complications of sequelae, and no evidence of persisting memory defects.

We have limited our observations to female patients, and since only 10 to 12 per cent. of admissions were manic, relatively few of these required intensive treatment. They were too few for statistical analysis, but most of them recovered. Of the recoveries, 12 have been selected as typical examples, and are summarized in the following table. One or two cases returned to hospital at a later date with second attacks, and one of these is included in the table. With regard to the mild relapses during the second phase, it is not unlikely that they could have been avoided with more experience in reaching the optimum spacing of treatments.

We feel that intensive E.C.T. has a definite place in the treatment of acute mania, and is worthy of closer attention.

Intensive E.C.T. in 12 Female Patients with Acute Mania.

Case.	Age.	Admitted.	E.C.T.	Periodicity during 1st phase (total treatments).	Relapses during 2nd phase of treatment.	Discharged.
F. M. N—	66	2.6.41	24.7.41	233II..(18)	One	14.1.42
F. C—	46	13.7.41	14.7.41	24II..(12)	None	14.8.41
F. C—	51	27.12.45 (2nd attack)	29.12.45	2322..(50)	Two	6.6.46
M. P—	23	24.7.41	24.7.41	2IIII..(8)	None	14.8.41
K. W—	29	23.7.41	24.7.41	233II..(24)	One	11.12.41
V. Y—	32	17.12.41	18.12.41	2II..(8)	None	14.1.42
G. L—	46	18.9.42	19.9.42	444..(20)	None	17.10.42
M. J. M—	26	24.1.45	25.1.45	22IIII..(13)	None	2.3.45
G. R—	31	8.6.45	9.6.45	43II..(20)	One	6.8.45
L. D—	42	2.2.46	4.2.46	332I..(20)	None	8.5.46
F. L—	16	6.7.46	7.7.46	42II..(26)	One	13.11.46
M. W—	47	12.9.46	13.9.46	3II..(15)	None	21.10.46
C. H—	49	19.9.46	19.9.46	2II..(15)	None	10.12.46

CONCLUSIONS.

Intensive electrical convulsion therapy is a superior method of control in acute mania. The treatment is initiated by multiple shocks daily, and continued with gradual decreasing frequency.

With ordinary care, the treatment is in our experience without danger or undesirable sequelae.

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ON THE CONCEPT OF "PSYCHOPATHY" AND THE TREATMENT OF SO-CALLED "PSYCHOPATHS."

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THE characteristic trait of the doctor's medical activity, compared with the quack's, is that the doctor is guided by two theoretical and practical postulates. The first one is diagnostic, and implies that the doctor must try to state the nature of the disease. If this is not possible, he must at least make an analysis of the symptoms in order to establish their patho-physiological connection, so that he knows which are the most important and most susceptible to treatment.

The second postulate is therapeutic, and implies that the doctor has to direct his treatment against the causes of the morbid condition or, if these are unknown or inaccessible, against the symptoms that are most important patho-physiologically, or most painful to the subject. He also ought to know why he is using a certain treatment and how it acts.

In current treatment of psychopaths these postulates are adopted only to a small extent, indeed, only exceptionally. This depends on the fact that the term psychopath is not the denotation of a morbid entity, not even of a syndrome.

Its immediate predecessor in psychiatric terminology is the *dégénéré*, the *deséquilibré* of French psychiatry, which came into vogue especially through Morel's theory of degeneration. At Morel's time and much later psychiatry had not become aware of the important conceptual distinctions between psychic, i.e., psychoneural *disease*, a constellation of disorders of mental functions in persons formerly mentally sane; psychic *imperfection* or *flaw*, conditioned by one or more pathological genes in the biological make-up of the individual, and depending on a lack of development or misdevelopment of some part of the brain; and psychic *defect*, i.e., a residual disorder of mental functions produced by a psychic disease which has come to a standstill but left behind incurable lesions of brain tissue.

Thus, such an excellent psychiatrist as Griesinger (1876) regards idiocy as a mental disease, and as late as 1911 Ziehen reckons the oligophrenias among the congenital defect psychoses.

I cannot tell when the term psychopath was first used in psychiatry. In 1891, however, Koch wrote a book on "Psychopathic Inferiorities" (*Psychopathische Minderwertigkeiten*). It derives from the French theory of degenera-

tion, but its author has the characteristic Teutonic propensity for abstruse systematization, and adopts a great many strange terms which evidently lack an empirical basis.

In his Manual of Psychiatry (1899) Kraepelin talks of "psychopathic conditions" as synonymous with degenerative psychoses (*Entartungsirresein*). Thus he seems to regard these conditions as mental diseases.

In his manual of 1916 Bleuler makes a distinction between original morbid conditions (*Originäre Krankheitszustände*) and psychopathic personalities.

As late as 1928 one finds in Kahn's paper on "Die psychopathischen Anlagen, Reaktionen und Entwicklungen" in Bumke's *Handbuch der Geisteskrankheiten* a classification of psychopaths, from the view-points of drives, temperament and character. Here, too, one finds the curious Teutonic trend of systematization combined with insufficient conceptual analysis, as appears from his choosing as principles of classification the Hippocratic term temperament, which is scientifically unusable on account of its unclearness, and the term character, which refers above all to "social and moral attitudes," and is not a clinical concept.

The heterogeneous origin of the characteristics of the so-called psychopathy is obvious, as is shown by a survey of the basic components of psychopathic personality given by Curran and Mallinson.*

According to Levine (1940), the psychopaths are "not normal, i.e., not mature, of good health and adjustment (!); not psychotic; not neurotic, although they may develop neurotic or psychotic symptoms; not necessarily feeble-minded; they live in a greater degree than is healthy in terms of short-term values of the pleasure principle; they tend to solve their life conflicts by overt behaviour."

Hall (1941): "Egocentricity, inability to profit by experience; emotional instability; lack of perseverance; unreliability and irresponsibility; defective judgment; suspiciousness."

Sprague (1941): "Inability to postpone, ineffective consideration of consequences; insufficient learning from experience; faulty synthesis; disproportionate responsiveness; affective dominance over intellect; disvaluation of reality; disregard for truth; insufficient social valuation."

Cleckley (1941): "Superficial attractiveness; cleverness, facility for talking and often apparently good intelligence; freedom from psychotic and more marked psychoneurotic symptoms; unreliability and irresponsibility; disregard for truth and honesty; unwillingness sincerely to accept any blame; absence of shame; cheating; lying, thieving, often for trivial gains; poor judgment concerning his own welfare; inability to learn by experience; egocentricity; poverty of affect; inability to see himself as others see him; inadequate responsiveness to special consideration or kindness; shocking or fantastic episodes of behaviour often associated with a drinking bout; infrequent sincere suicidal attempts; tendency to create scenes and situations so bizarre and untimely as to seem purposeless; sexual abnormalities, e.g., promiscuity (!); the manifestations of psychopathic behaviour may begin at

* Psychopathic personality, in "Recent Progress in Psychiatry," *Journal of Mental Science*, January, 1944.

any time, not necessarily in childhood; lack of perseverance; repeated failures to make good."

When considering these and other descriptions of psychopaths, one will find that the characteristics used to denote the condition are generally certain obvious symptoms or disorders of functions. Thus the definitions are purely symptomatic. Further, one finds in these descriptions of psychopaths a hotchpotch of psychiatric, individual psychological, social psychological, characterological and moral distinctive traits. Then there are collected under the same psychiatric term a great many symptoms or conditions of quite different origin: homosexuality and obsessions; moral insanity and conditions of sensitive over-conscientiousness; faulty development through pathological genes and lesional diseases (such as schizophrenia, ixophrenia, etc.); morbid changes in the frontal lobes and constitutional hypomanic moods, etc.

Often one hears psychopathy described as abnormal mental conditions appertaining neither to the classical vesanias nor to the oligophrenias. This definition is, however, unsatisfactory even from a logical point of view, as both *differentiae specifica*e are negative.

If one tries to tell what kinds of clinical morbid conditions and insufficiencies are confounded under the term psychopathy, one would find approximately the following conditions:

1. Conditions of psychological insufficiency or maladjustment on the basis of minus variants of the constitutional radicals.

To this group belong the very frequent sub-solid variants that play such a great criminological part as swindlers, cheats, mythomaniac fantasists, dupeurs, mystifiers, etc. Then the shy, timid, over-scrupulous subvalids with their tendencies to distempers, obsessions, narcomanias.

The substables of depressive or hypomanic types.

Even the plus variants of the constitutional radicals can develop states of insufficiency as some superstables with subcapacity or cerebral lesions of different kinds. These factors can originate rigid inflexible ascetic and unrealistic fantasists.

2. Misdevelopment on dyshormonic ground, especially sexual aberrations, homosexual and others. Here it is irrelevant whether these misdevelopments are caused by hormone factors alone or by such factors in connection with environmental influences.

To this group also belong the various kinds of dysmorphias (eunuchoids, gynecoids, infantiles, etc.).

3. Psychoneurotic conditions originating from early environmental agents, on the bases of constitutional plus or minus variants or lesional variants. The psychopathological result of these factors may be fixed neurotic attitudes or warped characters.

4. Lesional variants, among whom there are not diagnosticated schizophrenic conditions (e.g., so-called schizoids, schizophrenia simplex), hypophrenic conditions or slight encephalitides (Sjöbring encephalitis), traumatic insufficiencies, and the conditions that were formerly called epileptoids, epileptic characters or *epilepsia larvata*, but have now by Strömngren been given the good

and characteristic designation ixophrenes. To the latter group certainly belong a lot of the aggressive, explosive persons with tendencies to assaults of different kinds. It is an important fact that one often finds electroencephalographic dysrhythmias of epileptic type in non-epileptic relatives of epileptics. The great frequency of dysrhythmias in criminals of the assaulting type seems to indicate that many of these are ixophrenes.

5. Allergic conditions, with disposition for local or diffuse cerebral oedemata, giving rise to disorders of mental functions through diaschisis or in other ways.

Donner has of late described a case where a person in combination with an attack of urticaria showed symptoms of increased intracranial pressure, ending with loss of consciousness.

In the older psychiatric literature, cases of acute cerebral oedema were described among others by Rieger, who called these conditions *Akute Hirn-schwellung*. As the nature of allergic states was then unknown, these conditions of acute cerebral oedema could not be satisfactorily explained.

6. Narcomanias or euphomanias, where certain symptoms depend on a chronic intoxication of some kind, but an individual flaw must exist, which explains why some people become euphomanes, whereas others do not.

7. Sub- or misdevelopment of the emotional life with consecutive disorders of activity. It has been supposed that such conditions, which are very frequent among maladjusted and criminal persons, originate from hypoplastic or dysplastic states in the diencephalon. Whether there is anatomic evidence for that hypothesis I do not know. The existence of the clinical condition of emotional hypoplasia is, however, indubitable.

The coexistence of lesional hypothalamic states (destruction of hypothalamus or impediment of its function by tumours) and conditions of social and moral maladjustment is shown by the cases reported by Cox (1937), Dott (1938), and Alpers (1940).

These cases revealed a great many traits characteristic of asocial psychopaths: a lack of inhibition, together with the development of coarse traits; carelessness in habits; obvious antisocial tendencies; and a complete lack of insight into these changes. In those who survived operation for removal of the tumour the personality once more became normal. It is of special interest, too, that in those who died there was no evidence of damage to the cortex.

8. Conditions of specific vulnerability in the cortex shown by electroencephalographic dysrhythmias concomitant with small variations in the composition of tissue fluids.

Thus, one finds dysrhythmias in states of slight hypoglycemia, with a decrease of blood sugar to 70-80 per cent. of the normal values, whereas dysrhythmias do not occur in healthy people until the blood-sugar value has fallen to 50 per cent. Further, such dysrhythmias have been found in slight hypo- and hyperoxemic states. These changes in the cortical rhythms were associated with some degree of impairment of judgment and clouding of consciousness (Hill and Sargent, 1943).

These findings prove the connection between mental disorders and a specific cortical supersensitivity to small changes in the tissue fluids.

About 60 per cent. of the maladjusted exhibit abnormalities in the EEG,

some of epileptic type. Further, there is a close correlation between abnormal EEG and aggressive psychopathy (65 per cent.), and a significantly higher proportion of dysrhythmias among behaviour problem children. In Hill's cases the correlation of EEG to the personality age was greater than to the chronological or mental age, which suggests that the essential immaturity of aggressive psychopaths and of the behaviour child with temper tantrums is associated with a real subdevelopment of the cortex.*

From this brief summary one seems entitled to infer that most, if not all, the conditions called psychopathies are states of psychic disease. In this connection I should like to emphasize that from the time of Charcot there has been a general trend in medicine to transfer such conditions as were formerly regarded as abnormalities *sine materia* and provided with the inadequate designation "functional conditions" to the group of tissue lesions. The last step on this way is Sjöbring's discovery of the hypophrenic conditions, slight encephalitides, allergic states, and the findings of cortical dysrhythmias in epileptic and ixophrene persons, and in connection with slight changes in the tissue fluids.

The logical claims on a clinical diagnosis are :

1. If possible it should throw light on the condition and not only on its symptoms.
2. It should have a single sense so that there should be no doubt about the clinical condition or entity which is meant.
3. It should refer to conditions associated with factors that are independently variable, lest different diagnoses signify identical clinical entities considered from different sides or manifesting themselves in different shades.
4. It should be founded on an individual psychological and clinical analysis as thorough as is permitted by the existing development of science.

The diagnosis of psychopath and psychopathy does not satisfy any of these claims. It does not give any knowledge of the nature of the condition or entity. It is ambiguous. It does not refer to conditions associated with factors that vary independently. It is founded on insufficient analysis.

Therefore it gives an incomplete, warped and misleading picture. It bolsters up thought laziness, and is an obstacle to the progress of clinical and scientific thought in psychopathology. Therefore it should be abrogated as theoretically unsatisfactory, practically misleading and destructive to scientific thinking.

It is now about thirty years since I opened a campaign in Sweden against another term that has played a fatal part in medicine, i.e., "imputability" or "penal responsibility." The term is several centuries old; it is an alloy of theology, philosophy and jurisprudence, and has therefore a patina of venerability which has given it a strong viability. In spite of this it is now practically dead in Sweden, at least in scientific language.

The term psychopath is only a medical parvenu. It has no venerable descent of theology or philosophy, but derives from common medical thoughtlessness and thought muddle. How long it will survive I do not know, but I

* W. Grey Walter, "Electroencephalography" in "Recent Progress in Psychiatry," *Journal of Mental Science*, January, 1944.

know that I cannot dedicate the next thirty years of my life to its destruction, but must leave that task to younger colleagues.

From the above it appears that one cannot talk of a general treatment of psychopaths, as this term does not indicate the nature of the varying conditions for which it is used.

To the man in the street the term psychopath generally refers to people with behaviour disorders of a more or less asocial kind. Many psychopaths, however, are not socially maladjusted; for instance, persons suffering from obsessions, allergic conditions or slight encephalitides. Many neurotic people show psychic insufficiency of some kind which hampers them in their social tasks, but these symptoms of insufficiency need not have any asocial significance.

In a large group, however, the social maladjustment is a dominating trait which makes these people a torment, nay, even a danger to their environment. Owing to imperfect social organization, their treatment is an especially intricate and hitherto unsolved social and criminological problem. These emotionally aggressive and morally cool persons on the one hand, and on the other the flaccid inept and socially maladjusted ones, are at present, perhaps, the greatest burden on social welfare work.

The practical therapeutic difficulties with regard to these individuals can be summarized under three heads:

1. Society has no organization and no institutions for the treatment of such adult persons before they are prosecuted for crimes. Every doctor has met the characteristic cases when a worried father or mother seeks advice and help for a son or daughter who is on the way to social frustration or perdition. He or she is pleasure-seeking, unreliable, untruthful, does not keep promises, will not work, is dishonest, cheating and thieving, is attracted by low company, is sexually loose, etc., but he or she is not feeble-minded, not incapable; he could work if he "would." Often the doctor does not find any symptoms of psychosis or neurosis; he cannot prescribe any medical treatment; he advises change of environment, boarding in a decent family in the country and so on. Generally these measures are of no use; the case develops with a seemingly fatal regularity and often ends in a court of justice. In the good old times one exported such cases to the U.S.A., where most of them went to the dogs or were sent back by the consulates.

Sometimes these cases seem unexplainable to the family. The maladjusted son or daughter is a black sheep; all the other members of the family are decent and thrifty persons, and there is no mental taint in the family. In these cases one has probably to do with persons who suffer from some hypophrenic condition (a slight encephalitis, a post-traumatic insufficiency or other brain lesion, an allergic condition which has produced the warping of the social and moral attitudes).

When such persons commit crimes and are prosecuted there are two kinds of treatment, both of which have been tried here in Sweden and both found insufficient.

2. One of these is declaration of impunity with subsequent treatment in a mental hospital. But these people are generally lucid and formally ordered,

often underground and intriguing, more or less pronounced asocial individuals. They are disturbing, even dangerous in wards for quiet and sensitive mentally diseased persons. If placed in wards for unruly, vehement or uncleanly patients they are irritated and tormented by the abnormal behaviour of these patients.

They need a special medico-pedagogical treatment, which most alienists are not fit to administer, not having been trained for this task.

The presence of a great number of asocial, often very dangerous, maladjusted psychopaths in mental hospitals is an obstacle to the development of these institutions to a full equivalence with the hospitals for physically sick persons.

In brief, the so-called psychopaths do not suit the mental hospitals and these do not suit the psychopaths.

3. The second tried form of treatment of these lucid asocial persons is the prison. Among prisons I also include the institutions for certain dangerous abnormal criminals ("institutions of security," which are used in Sweden) as long as they are administered by prison staff under the central direction of the Prison Board.

The trend of scientific development shows with increasing evidence that persons supposed to belong to the group regarded as mentally misdeveloped on account of pathological genes are people suffering from mental disease, engendered by cerebral lesions.

To put these people in prisons is in contradiction to the medical claim that every member of human society, even if he has committed a crime, should be treated as humanely as is consistent with the security of society.

Therefore Swedish psychiatrists, with some rare exceptions, are opposed to the principle that mentally diseased persons, whether belonging to the classical vesanias or not, should be treated in prisons under the administration of the prison staff.

Further, the great group of so-called psychopaths is at present the most important theoretical problem of psychiatry, and the greatest practical problem of criminal policy and social welfare on the whole.

Certainly the prison administration declares that they will treat these diseased people in psychiatric wards in prison. But that is only nice talk as long as these wards are not provided with the necessary technical and personal resources, and the discipline and punishment spirit still prevails in the prisons.

The implication of these facts is that the so-called psychopaths must be placed under medical care in order to be scientifically studied and treated according to the diagnostic results achieved. The study of these cases needs all the personal, technical and diagnostic resources of clinical psychiatry. The EEG must become a routine examination in these cases, and be associated with biochemical studies and experiments to reveal latent cortical vulnerabilities. The new biological treatments, shock-therapy, lobotomy or chemotherapy, must be tried. It is unpractical to try for years by medico-pedagogical means to persuade aggressive or slack maladjusted people to behave in a socially acceptable way, when it is possible to make them socially adjustable through a lobotomy in half-an-hour.

Perhaps a medico-pedagogical treatment will for a long time be the only

practicable therapeutic measure, but in such cases it must be given by a medically and otherwise trained personnel that is really up-to-date as to its task.

SUMMARY.

The organization of the treatment of mentally diseased, abnormal or defective people should be carried out on the following lines:

For socially maladjusted people, delinquent or not, there should be established a medico-social treatment under central and local medical guidance. This organization should belong neither to the prison administration nor to the mental hospital organization.

This kind of institution for criminal policy and social welfare should be open also for such cases of social maladjustment as are liable to criminal development, but have not so far committed crimes.

Treatment in the institutions must be combined with out-patient treatment, and with consulting and preventive agencies for behaviour cases of all kinds. In Sweden there is a rudiment of such consulting and preventive agencies in the institution of *Skyddskonsulenter* (protective agents) provided by the new legislation on probation (1939). These, however, lack medical assistance, and are therefore rather primitive.

This organization must have at its disposal the best technical resources of clinical psychiatry for diagnosis and treatment, and be administered by a sufficient number of doctors with the best possible clinical training, and provided with competent psychologists and social workers as their assistants.

One of the most important tasks of such an organization would be to procure a fully competent staff for its very difficult work.

Only when we have tried to realize this project of social welfare are we entitled to say that we have taken the first step towards a rational and effective treatment of the great group of mentally diseased abnormal and defective persons who have been herded together under the inadequate and vacant diagnosis psychopathy and psychopaths.*

* Cfr. O. Kinberg, "Särskilt yttrande til K. Socialstyrelsens utlåtande över förslag till lag om samhällets barnavård," *Soc. meddel.*, 1934. O. Kinberg, "Om kriminalpolitikens centrala organisation," *Sv. juristtidn.*, 1937.

METHODS OF OFFICER SELECTION IN THE ARMY.*

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IN June, 1940, the first Area Psychiatrists in the United Kingdom, of whom I was one, were appointed. Although at first we were told that there were not many psychiatric cases, and in spite of the lack of encouragement in some areas, clinics were set up, and very soon the psychiatrists were overwhelmed by the number of patients sent, both officers and men. It became apparent to all of us who were doing the work that many of the men could have been eliminated at the source, for by going into the history of the individual patient, and giving him intelligence tests, one could have foretold fairly accurately his future in the army, i.e. whether he would be able to be trained as a soldier in a particular arm, and his length of service before his breakdown. But the process was that of elimination. The psychiatrist working alone managed to sort out the soldier, but there was at that time no disposal method except to hospital, which was not very useful for the dull and backward, and the chronic anxiety states. At the end of 1940, at the suggestion of a Command Psychiatrist, a Directorate of Officer Selection Personnel was set up, so that men joining the army would have their intelligence tested, and be interviewed by a personnel selection officer, and the dull and backward and the difficult cases interviewed by the psychiatrist, either for rejection from the army or for transfer to the unarmed or armed Pioneer Corps, or to any arm which was considered suitable. This process has continued since then, and has made great strides. At present no man is posted to any particular arm, but he comes into the army to primary training centres, where he is tested and interviewed, and after six weeks' general training is then posted to the arm most suitable for him. This procedure helped the problem of "other ranks," and it was hoped that the incidence of psychological illnesses in the army would be lowered, and the number of men sent to the psychiatrist brought within reasonable limits. Till then, the psychiatrist in the army had been working very fast, seeing as many as thirty to one hundred men a day.

But the problem of officers still remained, for the numbers of officers seen at psychiatric clinics were comparatively high, and they differed in no way from other ranks in that their destiny could have been foretold by an interview by the psychiatrist, plus intelligence tests, but it was not until December, 1941, that anything was done. At that time, production of officers was

* A Paper read at the Spring Meeting of the Northern and Midland Division, held on April 25, 1946, at the Central Hospital, Warwick.

insufficient to meet the army's requirements. Not nearly enough candidates were coming forward, and some 20 to 40 per cent. of cadets were returned to their units from OCTU after varying periods of abortive training. This high rejection rate could not go on, and it showed that the method of selection was faulty. The method consisted of picking men from units and sending them for a short interview by Command Selection Boards, which consisted of a colonel and two lieutenant-colonels brought in from surrounding units. It was quite obviously a "hit or miss" method. One colonel made a list of "officer qualities," and gave marks for intelligence, experience, leadership, captain of cricket, etc., and then added up the result at the end.

A new method was put forward by the Command Psychiatrist of the Scottish Command, who, by means of intelligence tests, psychological tests, and psychiatric interview, had found it was possible to predict accurately which candidates would do well at OCTU, which would be satisfactory, and which would be rejected. This method of selection was submitted to the Adjutant-General, and the first new type Officer Selection Board was set up in Edinburgh experimentally at the end of 1941. An ex-OCTU commander acted as President. In order to validate the procedure, the entire intake of two OCTU courses and a senior officers' course was passed through the Board, and a prediction made. At the end of the courses it was found that the reports of the commandants of the respective courses and those of the experimental board coincided to an astonishing degree. With the addition of practical out-door tests, conducted by military testing officers, the new system was approved and a number of similar boards were set up in each command. At this stage various modifications were introduced, and the position of the Boards was as follows:

President.

Deputy President.

Two Psychiatrists.

Three Military Testing Officers.

Three Personnel Selection Staff (N.C.O.'s, but later commissioned as "psychological officers"), who were educational psychologists.

This establishment was found to be sufficient for a Board coping with 80 candidates in a week. How were we going to set about bringing all the candidates to such a Selection Board? First, the Army acquired a number of large country houses, because it was necessary to test the total personality of each candidate, and as far as possible to get them out of their army environment and assess their ability to become good officers.

The candidates, having been recommended by the Commanding Officers, come to the Selection Board for three days. During this period they live in a mess resembling as closely as possible an officers' mess, and are treated as cadets. They go through a series of tests and interviews designed to throw light upon them from as many angles as possible, and their fate is settled at a Board Conference held on the final day. Each member of the Board contributes his views on the candidate and the President sums up and decides. The President, a colonel, is a regimental officer of good standing, young enough to make easy contact with the potential candidates. He, with the assistance

of a deputy president, a lieutenant-colonel, interviews every candidate and presides over the Board Conference, as well as directing the general policy.

After the candidate had come to the country house and had settled in, he had a talk from the President and was then taken to testing rooms, where he was given the following psychological tests: (1) questionnaire; (2) intelligence tests; (3) psychological tests, sometimes with projection tests. The factual questionnaire was given first, and acted as a buffer for the more difficult intelligence tests.

The Questionary.

Part I of the questionnaire gives the military history (including length of service, promotion, and action), education, employment, and games. From this information it is not difficult to see whether the man has progressed or stagnated, whether he has had any experience of leadership in the Army or in civilian life, whether he has made the most of his opportunities, or accepted life passively without effort on his part. This part may be used by the President as a guide to his interview.

Part II of the questionnaire, the medical and personal section, is confidential to the medical and psychological staff. The questions in it are arranged to reveal, not only the physical make-up, but also the presence of any psycho-pathology. For example, youngest children, only children, and those brought up by step-parents or strangers may present problems, and it is important to discover whether successful adjustments have been made in such cases.

Part III of the questionnaire deals with interests and the way leisure has been spent. The sports played tend to indicate the individualist, the solitary man, the good mixer. This may be confirmed by the interests, which distinguish also the energetic from the quiet, the shallow from the profound. Finally, in this part of the questionnaire the candidate is asked to write a description of himself as a friend, and then as someone who disliked him would do so. This enables the psychologist to see what insight a man has into himself.

Intelligence Test.

Whatever qualities comprise the make-up of a good officer, it is certain that adequate intelligence is of prime importance. It is fortunate, therefore, that this is the one most easily measured objectively, thanks to pioneer work in the educational field. The main difficulty in using one of the conventional tests in the Army is their dependence to a greater or lesser extent on education. To overcome this, Raven's Progressive Matrices is used, where the candidate is asked to complete a pattern from a number of possible answers, only one of which is correct. Two versions are in use. Twenty minutes are first allowed; work is then stopped and a line drawn across to mark the point reached. A further twenty-five minutes are given for completion and correction of what has already been attempted—a corrected answer being circled to distinguish it. In this way a measure of performance under pressure (or speed test) is obtained, as well as the ultimate performance (or power).

In addition to this, the candidate does a verbal test (V.I.T.), consisting of synonyms, opposites, analogies, and similar well-established types of question.

Note is made of any large discrepancies between scores in the two tests, or in the two versions of the Matrix. Such differences are of diagnostic value. A Matrix higher than V.I.T., for example, suggests that the subject's education has not kept pace with his intellectual possibilities. A higher V.I.T., on the other hand, suggests that the subject is rather more academically inclined. In the same way a higher grade at speed on the Matrix indicates the rapid, rather superficial worker, while a higher grade in the longer version picks out the slow, steady, accurate man.

The tests are marked on a percentile scale, which means the determination of the person's position in a hundred unselected people. If he falls in the top 10 per cent. he comes in Selection Group 1 (S.G. 1); if in the next 20 per cent., in S.G. 2; in the middle 40 per cent. (i.e. he is average), in S.G. 3; in the next 20 per cent., S.G. 4; and in the bottom 10 per cent., in S.G. 5. It is considered that an officer should be in the first two groups, or the top 30 per cent. of the general population. This figure was reached only after it had been found in practice that successful serving officers, such as those attending the Company Commanders' School at Edinburgh, are rarely below this standard. This officer intelligence range is then itself divided into similar percentile grades: "A" the top 5 per cent. of officers; "B" the next 20 per cent.; "C" the middle 50 per cent. (i.e. average officer); "D" the next 20 per cent., and D/E the bottom 5 per cent. Below is "E," in which a candidate is regarded as unsuitable, as his intelligence would not then be above the average of other ranks.

Later on a "Reasoning Test" was added to the battery of tests.

Psychological Tests.

These are given by the psychologist or the sergeant tester.

Word Association Test.

The questionnaire provides information about the life-history and career of the candidate as he himself regards it, but it is necessary to probe a little deeper. For this two tests are used. It has been known for some time that if a person is given a word and told to reply with the first thought that comes into his head it is possible to tap the "unconscious level." This technique, originally devised by Jung, has been modified and adapted for use on a group. A series of cards, each of which has a word on it, is shown in rapid succession, and the candidate has to write down his immediate reaction on seeing the word. The responses are then scrutinized by the psychologist. For example, from the answers to certain key words such as Mother, Afraid, Home, Worry, he can distinguish the anxious, spoiled, homesick youth from the stable, well-balanced man. Again, a number of words can be interpreted either in a war or non-war sense—Butt, Barrel, Desert, Arm, Front. The man with drive who is war-minded tends to seize on the military meaning and reject the other. All these points are valuable clues to personality.

Thematic Apperception (Story) Test.

The second test referred to above is an adaptation of Murray's Thematic Apperception Test, again modified for group work. The candidate is shown a slide projected on a screen, depicting an ambiguous social situation, which he is told to consider as an illustration to a story. He is then invited to write the story, showing what events have led up to the situation, what the characters are thinking, saying, and doing, and what the final outcome will be. The slide is shown for 30 seconds, and then 3½ minutes are allowed for writing. Here the candidate tends to project himself into the picture, identifying himself with the principal character. For example, one slide shows an elderly woman standing with her back turned to a young man who is fingering his hat, both of them looking depressed. The tendency is for the candidate to expose unwittingly his own relations with his home. Care must be taken with the interpretation of these stories, but with experience valuable information can be brought to light, enabling an opinion to be formed in the case just cited, for example, as to whether there is still parental dependence or whether the subject is independent. If all the stories end happily, with the hero overcoming his difficulties, it is likely that the writer is well balanced and energetic. On the other hand, where the hero is helpless, victim of his circumstances, and passive, there is a strong suspicion that the writer himself is an ineffectual person with little drive.

The work of the Psychologist on an Officer Selection Board consists of two parts: the measurement of a candidate's intelligence, and a tentative assessment of his personality. The tentative nature of the second part is stressed, because nothing more is attempted than to find Personality Pointers, which are hints or suspicions derived from paper work for the Psychiatrist to confirm or refute by interview.

This testing took a long time—something like three-and-a-half hours or more. At the end the sergeant tester and psychologist made "personality pointers," and assessed the total personality of the candidate without seeing him. After some experience they got very close to it, and it took a very brave psychiatrist to go against what the psychologist said.

The Psychiatrist on the Officer Selection Board interviews each candidate and makes an assessment of his personality. In England only 50 per cent. of the candidates were sent to him, but in the Middle East all candidates were seen by a Psychiatrist. In his interview he is aided by the "personality pointers" which the Psychologist has prepared for him.

To find out what a man really is, it is necessary to know something about his early life, his upbringing, his family background; to discover what sort of a person he has been at each stage of his development; to know what use he has made of the opportunities presented to him, and how he has dealt with the obstacles which have fallen across his path. The Psychiatrist must also enquire into the man's contact with others, his sociable and solitary tendencies, his day-to-day moods, his attitude to life. When all this is known of any individual, the story of his life becomes a reasonable whole. One has a vivid feature film in place of a disconnected series of flat and uninteresting stills.

Of his knowledge of what the candidate has been in the past and what he is at present, the Psychiatrist is able to prophesy fairly accurately how he may be expected to react in similar situations in the future. A man's basic personality seldom changes much in adult life. Occasionally some remarkable development takes place, but there is usually a special reason for this, and one which the Psychiatrist can detect. Indeed it is not uncommon for the Psychiatrist to say that given greater opportunities this man may well surprise everyone, revealing latent abilities which hitherto have had no chance to develop.

Many of the young officers who have failed to make good in the past have turned out to be men who would never have been commissioned had they come before a Psychiatrist. The Psychiatrist is trained to detect and exclude not only the mentally unstable, but also all those who habitually evade their difficulties, unloading their rightful responsibilities upon others, or seeking refuge at times of crisis in a series of petty ailments which enable them to retire gracefully, surrounded by the misplaced sympathy of all their friends. He can detect the selfish individual so wrapped up in himself and his own affairs as to have no thought to spare for the welfare of his men. He can detect the aloof, solitary, isolated man, who lives in a dream world, out of touch with reality. He recognizes the feeble, ineffective individual who has never learned to stand on his own feet, always asking for support, always leaning upon others, as helplessly dependent as on the day he was born. He sees through the bluster of the showman and the bully who, knowing their own inadequacy, try to cover it with a glib tongue or a show of force.

The Psychiatrist is happy, too, to recognize true metal when he finds it. He seeks the man who comes of sound stock (in any walk of life), brought up by his parents to be responsible and self-reliant, happy in his contact with his fellows, robust in his attitude to adversity; the man who has shown in every phase of his career a strong urge to achieve something positive. Such a man is likely to have a firm sense of purpose in relation to the War effort. With that addition he will make a sound leader and a good officer.

THE WORK OF THE MILITARY TESTING OFFICER.

It is probable that a process of selection for any walk of life could be founded on intelligence and personality tests, coupled with psychiatric interviews, for these are tests equally applicable to any profession or calling contemplated by the individual tested. However, in addition it is necessary to apply special aptitude tests, appropriate only to the occupation for which the candidate is destined, and indicating more specifically his ability to adapt himself to its peculiar exigencies.

In the process of officer selection these special aptitude tests are represented by the tests carried out by the Military Testing Officer, which, broadly speaking, seek to provide that officer with opportunities for observing the reactions of a candidate for a commission when confronted with a situation calling for qualities of leadership and personality necessary to an officer.

In the earlier stages of officer selection, it was considered that the role of the M.T.O. was to test the candidate's basic military training, but it was soon

realized that this training could be imparted at OCTU, and that it was more logical to consider first the candidate's suitability to undergo such training at all. In considering this question the tendency at first was to take each candidate in turn and put him through an individual test, e.g. forcing him to assume command of a body of men and order them about the completion of an allotted task, or calling upon him to carry out some physical task on his own. It was seen, however, that conclusions based upon observing such activities were frequently founded upon false premises, and accordingly the basis of the M.T.O.'s tests underwent a complete change.

It was realized that a more reliable indication of a candidate's qualities could be obtained by observing him as a member of a group confronted with a variety of situations, all presenting different problems for solution. The indication was more reliable, firstly, because each candidate was under observation all the time, and secondly, because he was not forced artificially to take a lead, but was allowed to find his own level in the group.

The principle therefore applied by the M.T.O. at present is to put his candidates into a group and, without appointing a leader, to observe this group engaged in as varied a selection of activities as possible. Instances of their activities are as follows:

1. A Group Discussion in which the group is allowed to choose its own subject and discuss it without any interference from Testing Officers.

2. Group tasks which are practical problems, requiring a certain amount of ingenuity and organizing ability for their solution, as, for example, the construction of a bridge over a ditch.

3. Group Games in which the emphasis is on planning, quick thinking, and the ability to look ahead.

4. Team Activity in which the candidates work as members of a team, in competition with another team, and the interesting feature is their ability to sink their individuality and assist others of their side.

The activities outlined are regarded simply as a variety of "situations," in the course of which the qualities of the individuals taking part gradually become apparent, and by the end of which the Testing Officer has built up a cumulative general impression of each man from which he is able to assess one general grading of his "officer quality," and thus a correct picture of the function of the M.T.O. is obtained.

An important point is that while the candidates are under test they should live in a congenial and friendly atmosphere. Accordingly, any attempt at regimentation should be avoided, and they should live under "officers' mess" conditions. This latter arrangement enables Testing Officers to live with them, and produces an easy atmosphere in which even the most diffident candidate has time to settle down, and by the second day at least will show whether he has the necessary qualities in him.

One final point needs emphasis. Any attempt to formalize the Testing Officer's opinion should be avoided. It has been impossible to agree upon a complete list of officer qualities, and therefore to make up such a list and insist upon the Testing Officer making a note on each quality in relation to

each candidate is profitless. The Officer's final opinion should be in the form of a report of his own composition, in which he records his impression in an informal way, and finally assesses a grading on officer quality as a whole.

That, in the main, is how officers were selected in the Army. Each test in itself could be an hour's lecture. And what was the result? There has been a follow-up system at the War Office ever since this "officer selection" has been going on; and up to a point it has been very successful. In February, 1942, 20 to 40 candidates out of every 100 were being sent back to their units through OCTU from the Middle East as of no use as officers. After the Board had been set up and was working, this figure came down to one candidate per hundred.

One of the difficulties of selection was that we had no adequate test of courage, even if you call it "war purposiveness." We were able to assess a quality like "courage" from the adverse reports of officers who had been sent back from the desert to Cairo after having failed to come up to the standard expected by their commanding officers. Amongst those who had been sent back were many who had psychotic breakdowns, and who could have been eliminated by this new technique of officer selection. One officer I saw, six weeks after commission, had acute schizophrenia. We went carefully into his psychological test and previous history and could find no reason for it. He appeared to be a normal individual who had developed schizophrenia. This type of illness happened quite frequently in the Middle East and in India. It seemed to clear up in about six weeks.

The follow-up procedure not only followed the candidate through OCTU and his unit, but also into battle, and it is hoped that it will be continued into civilian life, so that we may see whether these men who were picked by the Officer Selection Board have really come up to standard.

During all this time many doctors in the Army wanted to know why psychiatrists were being used in selection, and why they were not doing clinical work. The answer is that "selection" to a psychiatrist is almost "preventive psychiatry," eliminating the men who would break down under undue stress.

This method has now been accepted by industry, and by the Government in picking higher civil servants, and for A.T.S. officers. It is used in India for selecting senior officers and Indian Army officers. In the Middle East we had to deal with various nationalities—Palestinians, Southern Rhodesians, South Africans, Cypriots, Arabs—and for each nationality various alterations had to be made in the psychological tests. There is now an Officer Selection Board for "regular officers," but unfortunately there is no psychiatrist on this Board.

Selection of officers was the first positive approach to the scientific selection of leaders, and it is hoped that it will continue in other fields and levels as a branch of preventive psychiatry.

ADDITIONAL NOTE BY MAJOR S. YELDHAM, R.A.

The President was the head of the Selection Board; he was the judge, and took all recommendations from other people, weighing up various views, and making the decision.

As regards the "military testing" side, we wanted to look at the man in

action—to see his personality in contact with other people. In the end it was decided that it was better to form ten men into a group and give them a series of situations where they could show themselves as better or worse than the next man. We wanted to see them as individuals, members of a group, and as people in action, dealing with practical things and with people, and with a combination of both.

To begin with we had to get a good officer, of high intelligence, to act as Military Training Officer. He had to appreciate what others were doing and put the right construction on their actions. He had to be a man who had gone through the whole of the psychological tests, well balanced, and interested in other people. He need have no psychological training, for he was told what would emerge from various tests given. He was given a series of talks by the psychiatrist and shown men going through tests. When a Military Training Officer was trained he was given a group of ten men for two days, during which he was always in contact with them, ate with them, and gave them their tests, etc.

With regard to Group Discussion, the initial test was arranged as follows: ten men in a room, comfortably furnished, if possible, to put them at their ease. The M.T.O. tried to bring himself down to their level or raise them up to his. He tried to be one of the party. The group were told to discuss anything they liked, and suggestions were called for. Naturally three or four men in the group would suggest a subject. The M.T.O. would stay outside the circle formed by the group, and would sit and make notes on the interest in the type of subject proposed, how well it was received by the remainder, and how it was handled by the proposer. Once the discussion had started the M.T.O. would see how much each person contributed, how much confidence a man had in himself and other people, how easily he was led astray, how easily he could persuade others to take up his suggestions, no matter how impracticable they were. The M.T.O. watched people who were silent in order to discover why.

From a group discussion like this—emotional and theoretical aspects—the group had to proceed to where things had got to be done, e.g. make a large hole in the ground and carry heavy articles across it—a matter of intelligence and improvising all the time. Then the group would review the result in detail, two or three suggestions would be put forward and recommendations made, the M.T.O. observing the reasons for these—whether a man was aggressive, a man to be reckoned with, whether he could command attention, etc. Or maybe there would be a man who “worked out problems in the sand” and hoped the M.T.O. was watching. Others would start on a job without any consideration, and would be merely passive. The man who started the job was not always the leader. It was thus possible to get a good idea of a man’s capabilities in controlling people, picking other people’s brains, etc., and to obtain a general impression as to what sort of man he was. The group was given a series of tests like this.

It was found necessary to have one test where the M.T.O. would single each man out and observe him alone; he might often be good in a group but not alone. The M.T.O. would talk to him about anything he liked, whether he was interested in his own job, etc. Giving about 15 tests the M.T.O. collected quite a lot of information about him, meanwhile maintaining his confidence and keeping him feeling that he was a thoroughly good fellow!

At the end of the tests the M.T.O. wrote a report on each man’s personality. The team met at the final board meeting, where every candidate was considered, and the President—who had interviewed the man so that he knew his appearance and had a fairly general picture of him—sat in judgment, also calling on the Psychiatrist to give his opinion. The President then welded together the reports of the Psychiatrist and M.T.O. and decided whether the man should pass.

The method could be used in civil life. It would have much the same result, particularly in regard to selection for executive positions. There is no reason why any person should not be made the subject of a selection procedure if he is to be in charge of people who have themselves been picked.

DISCUSSION.

Dr. VAN SOMEREN: I would like to ask whether there could be selection for doctors, and more especially for psychiatrists.

Dr. GILLMAN: I consider there is a place for selection in the medical world.

Psychiatrists should be selected. There should be a type of selection for undergraduates and for children going to secondary schools. Although individuals should keep their ideas of what they wanted to be, they should be guided into suitable professions. Selection would also help doctors who wished to specialize in any branch of medicine—psychiatry, E.N.T., etc.

Dr. GOULD: There is a point which might be used as an argument against selection. Doctors, wherever they are, are usually very competent in their work. I think selection is desirable, but would suggest that there may be quite a definite point beyond which selection cannot go, except by the hard selection of "living it out." When it comes to selecting, the difficulties encountered in selecting doctors would be very much magnified, and only by eliminating the obviously useless would you get anywhere in selecting for high posts.

Dr. GILLMAN: I disagree—there is no proper judging of doctors' competence nowadays. In all selection people are graded, as they were in the army, into (a) those who are fitted to be future commanders in charge; (b) below that; (c) average; (d) below average; the poor officer and the bad officer. Doctors could be graded in the same way. Why should we have bad people in any profession? We should, by reasonable selection, following similar lines, be able to find the total personality in an individual—find his interests, and be able to guide him into a suitable profession or industry in which he is going to be happy. We cannot take away the fact that there are unhappy doctors—no one has investigated *why* they are unhappy in their work. If, with good intelligence, you are not happy in your work, you are usually unhappy because you cannot do it. We had to discharge one doctor from the Army—he should never have taken up medicine.

Dr. GOULD: I disagree.

Dr. GARMANY: I admire Dr. Gillman's methods of selection. We ought to sound a note of warning against accepting selection at the moment. It may well be that the excellent results which followed selection of officers were not ascribable to the accuracy of the method but to the closeness and prolongation of the examination. In the Navy we had a rather different set-up: men on the whole were in smaller groups; their attributes and difficulties were usually known fairly intimately by their officers. We found that on the whole not much was gained by personnel selection, and even our psychologists, who pretended to do personnel selection, knew that no one took a lot of notice of what they said. But we did find that the average executive officer, who was sometimes a most markedly stupid man, chose his fighting men with extraordinary accuracy, usually because he knew the men very well. We should not assume that because a man is unhappy in his work his difficulties are going to be remedied by changing it—the job is not always the cause of his unhappiness. I find that men who give trouble in one job usually give trouble in others.

Dr. GILLMAN: The Navy is a much more chummy service because they get the best personnel. The Army usually came last and had the worst material. So the Navy probably did not need selection in the same way. I do not, however, believe that anyone can say that a man would be a good officer because he knew him very well—this was tried in the Army and it failed.

Dr. MURRAY: Intelligence tests do not fluctuate, but emotional ones do—as the years go by there is sometimes a definite deterioration in medical men. Would you go so far as to say that one selection board is sufficient to plan a man's career for life?

Dr. GILLMAN: A doctor's intelligence is above the average intelligence of the population, but does not come up to the average officer. One selection board is not final—there should be a selection board at various stages—possibly three. In wartime the initial test had to be final on account of urgency. I believe that "selection" is going to become part of psychiatry, and that we shall need a lot of well-trained psychiatrists.

Dr. LADELL: I would like to ask whether there is any available literature about acute schizophrenia in wartime, as I have had cases referred to me as acute schizophrenics, and I could detect nothing but an "anxiety neurosis."

Dr. GILLMAN: When reports were made out by Medical Boards at home the typical symptoms were stated on the case sheet—auditory hallucinations, acute confusion, etc.—some of which resembled those of a toxic state. There is no doubt that everyone diagnosed "acute schizophrenia," and also no doubt that the condition cleared up in about six weeks, which would explain the absence of symptoms on arrival in England.

Dr. GOULD: I have known cases as mentioned which have shown signs of unreality, and in one case post-encephalitic disorder. The acute schizophrenic is confused, but it usually clears up. Some Americans have been talking recently about the slight amount of dementia or mental defect following schizophrenic states. Have you any answer to give?

Dr. BAMFORD: This point is somewhat of a "red herring." I was interested in the condition about twenty years ago and contributed one or two articles to the *Journal of Mental Science*. I do not think it is a military condition at all—it does occur in civilian practice. In a large mental hospital, with a fair admission rate, it was found that some cases recovered, others pursued a very rapid downhill course and became emaciated, and died within nine to twelve months. They had a combination of pathological features, i.e., a very small and narrow aorta with a very small heart, and in conjunction with this a fibrosis of the major viscera, mainly the liver, kidneys and spleen, and in addition a very large brain—a brain above the average in weight. The number of cases was not investigated, but nevertheless I did feel that a certain number might be described as acute or malignant schizophrenia.

I think both speakers have given very interesting addresses, and I wish to thank them. It has lifted the veil of secrecy that has surrounded the last few years. I have met a number of army psychiatrists who have been intensely enthusiastic about personnel selection tests, and for their extension to civilian practice. I do feel, from what army psychiatrists have told me, that there is a big future for personnel selection. I would like to congratulate Dr. Gillman on a most stimulating address.

Dr. CUTHBERT (Secretary): I wish to ask whether the process of selection brought to light emotional circumstances which might in the course of time in any case have produced neurotic breakdowns, and also does Dr. Gillman know anything about the application of the Modified Rorschach Test, possibly with a view to discovering these latent emotional situations?

Dr. GILLMAN: Yes, emotional situations were found. But we were out to select officers who would give us twelve months' good service, and who might during that time spend only a few minutes in fighting. It was difficult to assess what would happen in a few years' time. Unless a man is showing frank symptoms I do not think that anyone can say that he will break down, unless he knows the stresses and strains and situations that the officer will undergo. A lot of people broke down who, with all our investigations, showed nothing from the psychiatric point of view, i.e., an apparently stable individual with a good personality was sometimes evacuated to the "Exhaustion Centres." These got better and went back to the fight—but we were not able to follow these up properly. The Modified Rorschach Test was tried out at Edinburgh and was a failure—candidates could not be trained and the environment was all wrong.

Dr. DRURY: It was brought up by the G.N.C. whether group tests for nurses was advisable before they joined the service at all; there were different opinions as to this. One speaker said that for the last ten years we have had a diminishing number of candidates for nursing, and that the next five years would be even worse. Opinions differ on this—probably a test would be very different after two or three years' training.

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The Chairman in closing the discussion, proposed a vote of thanks to Dr. Gillman and Major Yeldham for their interesting and stimulating papers. This was carried by acclamation.

Dr. Stern was thanked for his hospitality and kindness in arranging a very interesting meeting.

Part II.—Reviews.

Psychoanalysis and Its Derivatives. By H. CRICHTON-MILLER, M.A., M.D., F.R.C.P. Second edition. London: Oxford University Press, 1945. Pp. 272. Price 3s. 6d.

Crichton-Miller's little book in the Home University Library well deserved a second edition. It gives a clear exposition of Freudian theory, and there are also excellent chapters on Analytical Psychology, Individual Psychology and the work of Prinzhorn. Especially good is the criticism of psychoanalysis and more particularly the section on the uncriticizability of the psychoanalyst himself. Crichton-Miller's main objection to psychoanalysis concerns one of its basic tenets—scientific determinism and the pessimism entailed. For others it is just this point of view that is acceptable, and puts psychoanalysis in a different category to the thaumaturgical theories of other psycho-therapists.

STANLEY M. COLEMAN.

Grundformen und Erkenntnis Menschlichen Daseins (Formative Principles and Knowledge of Human Existence). By L. BINSWANGER. Zurich, 1942.

There have always been some thinkers who maintain that the rational and quantitative method of modern science is only one, and at that a limited method of enquiry. They have especially doubted if it could be applied to the science of man himself, particularly to that of his psychic life, for it is in the study of those subjective phenomena which form the basis of psychology that observation of the world of objects, systematization and correlation of facts, testing of hypothesis by deliberate experiment seem most inadequate as methods of approach. One cannot "count" or "measure" emotions, interests, moral decisions and beliefs—subjects which lose their essential quality as soon as they are submitted to rational analysis and defy experimental verification. This does not mean that such subjects are not to be studied; these states of mind, such thinkers would hold, represent the most important elements in human existence, and are in the long run the foundations even of scientific thinking. It means that a different approach is required—one in which the student relinquishes any attempt at objectivation and quantification.

The nature of this approach has been hotly debated among Continental philosophers for at least two decades. New schools of thought have sprung up under different names, but all forming part of a European movement contesting the application of natural science methods to the study of man. For example, one thinks of "Phaenomenology" (Husserl); "Existential Philosophy" (Jaspers), recently taken up by French writers as "Existentialisme"; "Ontology" (Heidegger) and "Anthropology." (The latter term, generally used for the science of man's physical nature, was revived in its antiquated meaning among romantic thinkers early in the nineteenth century, when it denoted the knowledge of man's existence outside nature.) Except for some theologians, Anglo-Saxon writers and philosophers have taken little notice of this movement.

Psychiatry, a field ever attractive to philosophical disputants by reason of its uncertain foundations, has not been ignored by the new method of inquiry.

Prof. Van Der Horst, of Amsterdam, has recently published in two volumes an *Anthropological Psychiatry* written in Dutch. Dr. Binswanger, one of the leading psychiatrists and philosophers in Switzerland, first published a series of papers in which he analysed the "existence" of the manic patient with flight of ideas, and later of a paranoid schizophrenic. He showed in these articles how the anthropological aspect helps to understand the psychopathology of patients.

In the present volume he deals with a much more general problem of normal psychology. He analyses "love" as one of the basic forms and moving principles of human existence and, at the same time, tries to establish love as an instrument for the understanding of man—that is, as a psychological method. The analytical part deals with the various kinds of love, from love as relationship between the sexes, friendship, kinship, to infantile, paternal, fraternal love, and to such attenuated impulses as are found in loving admonition of a pupil and friendly reprehension for a broken promise. There is no attempt to reduce the wide scale of human love experiences to a theoretical "drive" such as the libido in the work of Freud, whose simplifying abstractions indeed are frequently attacked. The result of Binswanger's descriptive analysis is that one cannot understand man if one considers him as an individual being only; the inter-human relation between the loving and the beloved gives access to a deeper psychological knowledge, and to a better understanding of the individual himself.

The second part of Binswanger's book is an epistemology of his method based on a wide range of philosophical reading. He establishes the place of his approach within the tradition of ideas, defends its right against similar theories, and justifies his view that psychology can never be based on rational thinking alone, but on both reason and love.

Although not dealing with the psychology of the abnormal, the author addresses himself to the psychiatrist. His professed aim is to unfold the complexity and variety of normal human experience. Without a realization of its diversity, he thinks, an understanding of the abnormal is impossible. It follows that he regards as utterly futile certain attempts of psychiatrists to explain human existence from the narrow viewpoint of psychopathology.

Whatever the ultimate value of Binswanger's scholarly work, it appears a most timely reminder to modesty in view of the excessive claims of to-day's psychology and psychiatry. That he should have made love the object of his study in the midst of a murderous war, and proclaimed its value as an instrument of human understanding, entitles him to the attention of those who, unfamiliar with his philosophical foundations, think him prematurely sceptical in respect of a scientific psychology.

W. MAYER-GROSS.

Introduction to Present-Day Psychology. By CURT BOENHEIM. Staples Press, Limited, Westminster, S.W. 1.

Even the most competent of authors would find it difficult to cover in an introduction of one hundred pages the whole field of contemporary psychology. This is to be kept in mind in judging Dr. Boenheim's book. He attempted the difficult task in twenty-four lectures to adults of the W. E. A. of which the book is a transcription. It ranges from "the crying baby" to "industrial psychology" and from "Gestalt Theory" to "psychosomatic medicine." Like so many popular writers on the subject Dr. Boenheim tends to under-rate the intelligence and knowledge of his lay readers, who, nowadays, know more about psychology than we think. One can only hope that, as Professor Wolters writes in the Foreword, this "pleasant sketch of the territory" will inspire many to put forth real effort into further exploration. A list of books given at the end is intended for this purpose.

A. P. TAIT.

Het Gezinsleven van Schizophrenen. (The Family Life of Schizophrenics.)

By J. ZURING. Amsterdam, 1946.

De Betekenis van de Phaenomenologische of Existentele Anthropologie in de Psychiatrie. (The Significance of the Phaenomenological or Existential Anthropology in Psychiatry.) By J. H. VAN DEN BERG. Utrecht, 1946.

These are two dissertations for the degree of M.D. of Dutch Universities, each being a well-documented monograph on a special aspect of schizophrenia. Zuring studied the family life of 304 married schizophrenics discharged from hospitals between 1933 and 1942 and now under the excellent After Care Service of the Amsterdam Health Department. These patients represent 43 per cent. of all schizophrenics discharged during this period. Three quarters of the series were women; but only in 16 per cent. could the outbreak of the psychosis be connected with childbirth or other generative factors. Marriage age and average number of children in the patients' families showed little difference from the average of the Amsterdam population. Only a few patients married after discharge from hospital and only 16.7 per cent. of a total of 670 children were born after the first schizophrenic attack. This seems to dispose of eugenic objections to early discharge of remitting schizophrenics. The author sums up the general result of his studies as follows: "The majority of discharged schizophrenics appeared to react favourably to their familiar surroundings without causing any disturbance of the family life." Families with social difficulties are discussed in detail. Decline on the social scale was especially conspicuous in cases belonging to higher social classes; under an apparently quiet and unruffled surface of family unity much tension and hostility was found due to the patient's behaviour; bringing-up of children and their proper education was sometimes difficult—in fact 15 per cent. of the families under investigation were found to be known to the Amsterdam Children's Police. These were families in which either the schizophrenic patient had married an eccentric, psychopathic or defective partner; or the patients' pre-morbid personality was poor, immature or even defective. The After Care Service should prevent the return of such a case to their family, return him to hospital or board him with strangers.

The thesis of Van den Berg is an attempt to place the new "anthropological" approach to psychiatry, initiated by L. Binswanger (see review of his book, p. 112) and others, in a historical perspective and to justify its philosophy. Its application to clinical problems is demonstrated in a schizophrenic patient. He is a semi-stuporose, manneristic, deteriorated case who gives characteristic short "nonsense" answers to all questions when he speaks at all. The author tries to penetrate into the patient's special world and into his form of existence as to its time, space and meaning. Some of his interpretations are strangely reminiscent of the primitive interpreting lightning as God's anger—or the poet perceiving Nature's kindness in the flowers of Spring. All depends on the interpretation of expression (movements, gestures, words) which is—according to the author—the central problem of this method of psychiatry. The critical question of how the author's observations can be confirmed or disproved, how the truth of his interpretations may be gauged against that of others, remains unanswered.

W. MAYER-GROSS.

The Biology of Schizophrenia. By R. G. HOSKINS, M.D. London: Chapman & Hall, 1946. Pp. 191. Price 15s.

This is an excellent summary of the schizophrenia problem written primarily for the intelligent layman, but at the same time for psychiatrists—possibly a curiously mixed audience, but he qualifies this by referring to "beginners in research in the field." The book is really an amplified version of the three

Salmon Memorial Lectures delivered at the New York Academy of Medicine in November, 1945. This is the first time the lectures have been delivered by a non-psychiatrist, but Dr. Hoskins is a physiologist and is director of research at the Worcester State Hospital.

The book is divided into four sections dealing with the biology of man in relation to schizophrenia, the pattern of schizophrenia, psychosomatic aspects of schizophrenia and a biological appraisal of schizophrenia.

The writer is a supporter of integrative evolution, and considers that somewhere in the course of integration there has been a failure, and this failure results in schizophrenia. The cause is unknown. From the study of patients at the Worcester State Hospital the author considers that almost to a man they have failed to have the inner hardihood to adjust to their life situation. None had attained to normal adult sex adjustment. Vocational and social maladjustments were very common. There is a lack of robustness of personality, a lack of the ability "to take it," or more properly put by Rosenzweig, a reduced frustration tolerance.

Possibly the most interesting chapter to the psychiatrist (who is *very* familiar with people who are "unable to take it") is the chapter on the psychosomatic aspects of schizophrenia. The writer deals with the endocrines at length, and satisfaction must be felt in this country that the biopsy work of Hemphill and Reiss on the testicle receives full credit. The fault probably lies with a deficiency of a gonadotropic factor from the anterior lobe of the pituitary, which is, of course, the master gland of the endocrine hierarchy. Oxygen metabolism, the specific dynamic action of food, carbohydrate metabolism, homeostasis and other subjects are dealt with—mostly quite beyond the ken of the intelligent layman.

In conclusion the physiologist shows his wisdom and a scientific acumen (which the psychiatrist does not always show) in appealing for increased prosecution of research along the lines he has indicated, rather than further pursuit of what he aptly describes as "that will-o'-the-wisp, that semi-projective synthetic artefact, 'the patient as a whole'."

G. W. T. H. FLEMING.

On Suicide and Attempted Suicide. By K. G. DAHLGREN, M.D. Lund: Universitets Bokhandel, 1945. Pp. 354.

This comprehensive and thorough study has been carried out by the Associate-Director of the Psychiatric Clinic of Lund University Medical School, Sweden. It was done during his period of service in the neighbouring town of Malmö, and consists of a statistical and psychiatric review of suicide and attempted suicide occurring in that town during the decade 1933-1942.

Malmö is a town comprising most of the characteristics of our modern European cultural environment. It is a town of about 150,000, with a slowly-growing population. It is a sea-port in close contact with the rest of Europe; it has a fair amount of industry and is also the focus of the province of Scania, an intensively cultivated agricultural area. It "enjoys" a climate similar to our own and the population is recognized as being one where the temperamental characteristics are in the direction of restraint and undemonstrativeness. This study is, therefore, specially valuable and interesting.

The work is divided into two sections, statistical and psychiatric. The statistical part has been subjected to analysis by a statistical expert, which has had the effect of making the tables with which the book is richly supplied, especially interesting and sometimes surprising, particularly in regard to probability factors.

Certain generally accepted ideas in regard to the incidence of suicidal attempts have been modified. "Men have died and worms have eaten them,

but not for love," has long been accepted as being true and generally the view in regard to suicide has been that unhappy love and marital troubles are responsible for suicide in females but not in males, where economic troubles are held to be the most important. Dahlgren, however, shows that in his group of about 300 cases this point is not statistically important or significant. On the other hand, it seems true that economic worries do in fact produce more suicidal attempts in men. The commonly held view that marriage status is important is also subjected to some check. While there is a suggestion that divorced persons and individuals who have lost the marriage partner by death are in danger, Dahlgren's statistics do not confirm the belief that marriage has any suicide preventive influence.

In Britain, the incidence of suicide has steadily risen. This has not been the case in Malmö. During the last five years of the survey the incidence in males actually fell, although the incidence in females rose, but the figures have "not shown any definite tendency in either direction." It would be interesting to reflect on the possibility of Sweden's history as a factor in this. The country has not known war for 150 years or so and, apart from the Kreuger crash, which had a very widespread effect although it was effectively recovered from, is in a stable economic position on account of its great natural riches in iron, timber and water power, to mention only three factors.

In regard to war, it is interesting to compare Dahlgren's statement and figures as to the incidence of suicide in war. There is a tendency to believe that war reduces suicide in belligerents and various theories have been put forward to account for this. Dahlgren, however, points out that the fact is that suicide also decreases in non-belligerent countries during war and shows that the suicide rate in males began to show a decline as far back as 1938.

From the psychiatric point of view, the book consists of a scrutiny of the suicidal situation in the great general groups of psychotic disorder and here the work follows along orthodox lines, with, however, many special points of interest. Dahlgren comments on the bizarrerie of suicide in the parergasias (Meyer), the schizophrenic, paranoid group, and the attachment to depressive reactions in the ordinary way. He is especially interesting, however, in regard to the large and rather nebulous group of personality disorders where the relative failure of integration and personality formation leads to suicide consequent on evaluations of life situations biased by relatively poor judgment, leading to despair and so on. This group, generally subsumed under psychopathy in this country, has had a new nosological concept added to it in the form of ixophrenia. This concept corresponds to the epileptoid constitution, and Dahlgren quotes Trousseau, who stated that any sudden murder or suicide carried out by an apparently previously "normal" person, was surely a manifestation of epilepsy. Ixophrenia derives from the Greek Ixodes—viscous, adhesive. The features of the ixothymic or ixophrenic constitution are, in the words of Sjöbring, Emeritus-Professor of Psychiatry at Lund, "Heavily intense, monotonous, inelastic. They are inert and circumstantial, sticky, perseverating . . . their thoughts attach themselves to the object which interests them for the moment . . . they are hypersexual, childishly caressing, religious, hypochondriacal, paranoid. They often show pronounced changes . . . they are happy, cheerful, irritable, dissatisfied, scared, sad . . . they are always more or less a conflict and, if so, in a more or less explosive state." One feels that experience shows that this description corresponds quite accurately with a personality type frequently encountered in psychiatric practice.

To the subject of motive Dr. Dahlgren brings a clearly objective mind. He points out that when a suicide occurs in a psychosis one tends to look no further for the cause but to lay it at the door of the psychosis. He says: "It is rather interesting that we find data concerning the motive even in such cases where there is a so-called endogenous psychosis," and "There is, further,

at least a possibility that in cases characterized as manic-depressive psychosis, these motives may have contributed to the depression which later became the real cause of the suicide."

An interesting section is devoted to the suicide of apparently normal subjects. Dahlgren is inclined to beg this whole question as being, in his own words "a layman's one." We have, he points out, no criterion of the subject's state of mind at the time, and he quotes the all too true finding of Syerberg, that the so-called "Bilanz" suicidal attempt, well prepared, is almost always successful. The whole philosophy of suicide is carefully gone over in this section, and it is interesting to observe the entire absence of psychoanalytic terminology, for the book comes from a country where psychoanalytic theory has been almost completely rejected.

W. M. C. HARROWES.

Criminal Justice and Social Reconstruction. By HERMANN MANNHEIM, Dr. Jur. London: Kegan Paul, Trench, Trubner & Co., 1946. Pp. 290. Price 15s.

The author discusses the protection of human life in relation to homicide, suicide, euthanasia, the extermination of socially useless lives, sterilization, castration, birth control and abortion. The protection of sexual and family life is dealt with under the headings of homosexuality, exhibitionism, bigamy, adultery, incest and neglect to support the family. More than a third of the whole book is given up to a consideration of economic crime, and includes such matters as theft, the protection of public and private property, fraud, share-pushing, usury, profiteering, taxation frauds, strikes and absenteeism. The final chapters deal with replanning criminal justice.

The author believes that a new conception of criminal justice is necessary in a world which is passing through a crisis in social, economic and moral values, and considers his material from a legal rather than from a medical point of view. A great deal of detailed information is given with the clarity which we associate with Dr. Mannheim's writings. At the same time his outstanding prejudices will provoke strong opposition from many of his readers. The key to his point of view seems to be apparent in his statement that "Criminal law has not yet become sufficiently aware of the fact that we are living, not in an individualistic but in a mass age, where everything has to be adapted to the use of mass methods." Presumably, the future will decide whether the individual will derive greater or less freedom, happiness and security in consequence.

The medical reader will miss any discussion on the importance of alcoholism and prostitution in association with the protection of sexual and family life, and the significance of gambling in relation to family life and economic crime.

The book is well documented, and a useful bibliography is provided for each section. Like the author's previous works *The Dilemma of Penal Reform* and *Social Aspects of Crime in England between the Wars*, it is stimulating and provocative. It is reasonable to believe that these may have been the author's main incentives for writing his interesting and instructive book. It deserves a place on the shelves of all who are concerned with the social and legal aspects of crime, and whether they approve or disapprove of the author's standpoint.

W. NORWOOD EAST.

Part III.—Bibliography and Epitome.*

AN attempt is being made to provide as far as possible a complete bibliography compiled from journals dealing not only with Psychiatry and Neurology (which are really inseparable) and their ancillary subjects, psychology, anatomy of the nervous system, criminology, etc.

A number of titles may appear to have a very remote relation to psychiatry, but they are included for the sake of completeness.

If any reader can add the names of journals to the following list, which it is hoped to publish each year in the January number, the addition will be gratefully received and acknowledged.

Those journals which are available in the Library of the Royal Medico-Psychological Association are marked "1," those available in the Library of the Royal Society of Medicine are marked "2," those in the Library of the British Psychological Society are marked "3," and those in the Library of the British Medical Association are marked "4."

The titles of these journals are mostly in the form given by the Board of Editors of Publications of the American Psychological Association, January, 1939. Contributors are requested to use the exact form given below.

PSYCHIATRIC JOURNALS.

- 2 *Abh. Neur. Psychiat.*
- Abh. Psychother.*
- 2 *Acta Española Neur. y Psiquiat.*
- Acta Neurol., Naples.*
- 3, 4 *Acta Psychiat. et Neurol.*
- 3 *Acta Psychol., Hague.*
- Acta Psychol., Keijo.*
- Alg. Neder. Tijdschr. Wijsbegeert. Psychol.*
- Aliéniste Français.*
- 2 *Allg. Ztschr. f. Psychiat.*
- Altersprobleme.*
- Am. Imago.*
- 2 *Am. J. ment. Def.*
- 2, 3 *Am. J. Orthopsychiat.*
- 1, 2, 3, 4 *Am. J. Psychiat.*
- 2, 3 *Am. J. Psychol.*
- Am. Psychol.*
- An. Bras. Hig. Ment.*
- An. Instit. Psicol. Univ. B. Aires.*
- An. Psicotec., Rosario.*
- Anal. Inst. Neurol., Montevideo.*
- Analele Psihol. (Rumania).*
- Anales de psicol., Buenos A.*
- 2, 3 *Année Psychol.*
- 2, 3 *Ann. Méd. Psychol.*
- 2 *Ann. Osp. psichiatri., Perugia.*
- Appl. Psychol. Monogr.*
- Arch. Psychiat. Inst., Sendai.*
- Arch. Anthropol. crim.*
- 2 *Arch. Argent. de Neurol.*
- Arch. Argent. Psicol. norm. pat.*
- 2 *Arch. Bras. de Neur. e Psiquiat.*

* A number of abstracts in this section are reproduced from *Chemical Abstracts* and *Psychological Abstracts*. To the Editors of these two Journals we extend our grateful thanks.

Arch. Brasil Hig. Ment.
Arch. Chilenos de Crim.
Arch. Ital. di Studi Neuropsich.

- 1, 2 *Arch. Neurobiol.*
 4 *Arch. Neurol., Paris.*
 2 *Arch. de Neurol. de Bucarest.*
 1 *Arch. de Neurol.*
 2 *Arch. di Antropol. Crim.*
Arch. di Crim. Neuropsiquiat. y Disc. Con., Quito.
Arch. di Sci. Cereb. Psich., Salerno.

- 2, 4 *Arch. f. Psychiat.*
 2, 3 *Arch. ges. Psychol.*
Arch. Internat. de Neurol.
Arch. Ital. Psicol.
Arch. Krim. Anthropol.

- 1, 2, 3, 4 *Arch. Neurol. Psychiat.*
Arch. Neur. Psychiat., Mex.
 2, 3 *Arch. Psicol. Neurol. Psychiat. e Psicoter.*
 2, 3 *Arch. Psychol., Genève.*
 2, 3 *Arch. Psychol., N.Y.*
Arch. Relig. psychol.
Arch. Speech.
Arq. da Assist. a Psicop. de Pernambuco.
Arq. de Neuro-psiquiat., Brasil.
 3 *Austr. J. Psychol. Phil.*

Beih. Z. angew. Psychol.
Beih. Zbl. Psychother.
Bol. Inst. Psiquiat., Rosario.

- 2, 3, 4 *Brain.*
 3 *Brit. J. Educ. Psychol.*
 2, 4 *Brit. J. Inebriety.*
 1, 2, 3, 4 *Brit. J. Med. Psychol.*
 2, 3, 4 *Brit. J. Psychol.*
 2, 3, 4 *Brit. J. Psychol. Monogr. Suppl.*
Bull. Canad. Psychol. Ass.
 2, 4 *Bull. de la Soc. de Psychiat. de Bucarest.*
 2 *Bull. de la Soc. Roumaine Neur. Psychiat. Psychol. Endocrin.*
Bull. du Group. Franç. d'étud. de neuro-psychopath. infant.
Bull. industr. Psychol., Melbourne.
 2 *Bull. Los Angeles Neur. Soc.*
 2 *Bull. Menninger Clin.*
Bull. Milit. Clin. Psychol.
Bull. Soc. Psihol. med., Sibiu.

Canad. Journ. Occup. Ther.

- 2, 3 *Cath. Univ. of Amer. Studies in Psychol. and Psychiat.*
 2 *Cervello.*
 2, 3 *Character and Per. (now J. Personal).*
 2 *Child Developm.*
 2 *Child Developm. Abstr.*
Child Developm. Monogr.
Child Study.
Chin. J. Educ. Psychol.
Chin. J. Psychol.
 3 *Comp. Psychol. Monogr.*
 2 *Confinia Neurol.*
Contr. del Lab. di Psychol.
Contr. Lab. Psicol., Milan.
Contr. psychol. Theor.
Criança Portuguesa.

- 2 *Deutsche Ztschr. f. Nervenh.*
2 *Dis. Nerv. Syst.*
- 3 *Educ. psychol. Measmt.*
Egypt. J. Psychol.
- 1, 2, 3, 4 *L'Encéphale.*
2 *Epilepsia.*
Evolut. Psychiat.
- Fiziol. Th. S.S.S.R.*
2 *Folia Neuropath. Esthon.*
2 *Folia Psychiat. et Neurol. Jap.*
2 *Fortsch. Neur. Psychiat.*
- 3 *Genet. Psychol. Monogr.*
Giorn. di Psych. e di Neuropat.
- Hum. Factor.*
2, 3, 4 *Hyg. Ment.*
- Illinois Psychiat. J.*
2 *Index Neurol. y Psiquiat., Buenos Aires.*
3 *Indian J. Psychol.*
Indiv. Psychol. Bull.
3 *Industr. Psychol.*
3 *Industr. Psychotech.*
- 1, 2, 3, 4 *Int. J. Psychoanal.*
2, 3 *Int. Z. Psychoanal. u. Imago.*
- Jap. J. appl. Psychol.*
Jap. J. Exp. Psychol.
Jap. J. Psychol.
- 1, 2, 3 *J. Abnorm. Soc. Psychol.*
J. Am. Soc. Psychic. Res.
3 *J. App. Psychol.*
2, 4 *J. Belge Neur. Psychiat.*
2 *J. Comp. Neur.*
- 1, 2, 3 *J. Comp. Psychol.*
J. Consult. Psychol.
J. Crim. Law and Criminol.
2 *J. Crim. Psychopathol.*
2 *J. de Psychiat. Infant.*
3 *J. Educ. Psychol.*
J. Except. Child.
3, 4 *J. Exp. Psychol.*
2 *J. f. Psychol. u. Neurol.*
3 *J. Gen. Psychol.*
2, 3 *J. Genet. Psychol.*
J. Geront.
J. Juvenile Res.
- 1, 2, 3, 4 *J. Ment. Sci.*
1, 2, 3 *J. Nerv. Ment. Dis.*
- 1, 2, 3, 4 *J. Neurol. Neurosurg. Psychiat., London.*
J. Neuropath. and Psychiat., Leningrad.
1, 2 *J. Neuropath. Ex. Path.*
2, 4 *J. Neurophysiol.*
J. Neuropsychiat. du Pacifique.
2 *J. Neurosurg.*
3 *J. Parapsychol.*
J. of Psychic. Res.
J. Psihoteh.
2 *J. Psycho-Asthen.*

- 2, 3 *J. Psychol.*
J. Psychol., Moscou.
- 2, 3 *J. Psychol. Neurol.*, Leipzig.
- 2 *J. Psychol. Norm. Path.*
J. Soc. for Psychic. Res.
- 3 *J. Soc. Psychol.*
J. Speech Dis.
- Kriminal.*
- 3 *Kwart. Psychol.*
- Mag. psychol. Szle.*
- 2 *Ment. Health.*
Ment. Health Obs.
- 2 *Ment. Hyg.*, Lond.
- 2 *Ment. Hyg.*, N.Y.
Ment. Hyg. Rev.
Ment. Hyg. Bull., Indiana.
- 3 *Mind.*
Mschr. Krim. Biol.
- 2 *Mschr. Psychiat. Neurol.*
- Ned. Tijdschr. Psychol.*
- 2 *Neopsichiat.*
- 2 *Nervenarzt.*
- 3 *Neue psychol. Stud.*
Neurbiol., Pernambuco.
- Neur. a Psychiat.*, Česká.
Nevrasse.
- 2 *Nevro-path. i. Psikhiat.*
- 2 *Note e Riv. di Psichiat.*
Now. Psychjar.
Nuova Riv. di Clin. ed Assist. Psichiat.
- Obshch. Klin. Nevropat.*
- 2, 3 *Occup. Psychol.*
- 2 *Occup. Ther. and Rehabil.*
- 2 *Onder. Psychiat-Neur. Klin.*, Utrecht.
- 2 *Osped. Psichiat.*
- 3 *Person. J.*
Pisani.
Polsk. Arch. Psychol.
Prace Psychol.
- 2 *Proc. Amer. Assoc. Stud. Ment. Def.*
- 2 *Proc. A. Res. Nerv. and Ment. Dis.*
- 3 *Proc. Soc. Psych. Res. London.*
- 3 *Psichotec.*
Psicoanalisi, Rome.
- Psicoter.* Cordoba.
- Psyche*, Cambs., Mass.
- Psychiat. Monogr.*
- 2 *Psychiat. en Neurol. Bl.*, Utrecht.
- 2 *Psychiat. et Neurol. Jap.*
- 2 *Psychiat. Neurol. Wchnschr.*
- 2 *Psychiat.*
- 1, 2 *Psychiat. Quart.*
- 2, 3 *Psychoanal. Quart.*
- 1, 2, 3 *Psychoanal. Rev.*
- 2, 3 *Psychol. Abstr.*
- 2, 3 *Psychol. Bull.*
Psychol. Clin.

- Psychol. Exch.*
 3 *Psychol. Forsch.*
Psychol. Index.
 2 *Psychol. Monogr.*
Psychol. Rec.
 3, 4 *Psychol. Rev.*
 3 *Psychol. Rev. Monogr.*
Psychol. Stud. Kbh.
Psychol. Stud. Univ. Bp.
Psychol. wychów.
 3 *Psychomet.*
Psychometr. Monogr.
 2 *Psychosom. Med.*
 2 *Psychosom. Med. Monogr.*
- Quart. J. Speech.*
 2 *Quart. J. Stud. Alc.*
Quart. Rev. Psychiat. Neur., Washington.
- Rass. Neurol. Veget.*
Rass. Studi Psichiat.
Rev. Argent. Neurol. Psiquiat.
Rev. de Psicoanal., Argentina.
Rev. di Neur. e Psichiat., S. Paolo.
Rev. di Psiquiat., Chile.
Rev. di Psiquiat. y Crim.
Rev. Espan. de Oto-neuro-oftal. y Neurocir.
 3 *Rev. Franç. Psychoanal.*
Rev. Ibero-Amer. de Anal. Biblio. de Neurol. y Psiquiat.
Rev. Mex. Neurol. Psiquiat. y Med. Legal.
- 1, 2, 4 *Rev. Neurol.*
 2 *Rev. Neurol. de Buenos-Aires.*
Rev. Neurol. Psychiat., Praha.
 2 *Rev. Neuro-psiquiatr., Lima.*
 2 *Rev. Oto-Neur.-Oftal. Cir. Neur. Sud-Am.*
Rev. Neuropsiquiatr.
Rev. Psicol. Pädag.
Rev. Psicoandl., B. Aires.
 3 *Rev. Psihol.*
Rev. Psihol. Icor. Aplic., Sibiu.
 2 *Rev. Psiquiat. Crim., B. Aires.*
Rev. Psiquiat., Uruguay.
Rev. Psiquiat. y Disc. Con., Chile.
Rev. Sudam. Psicol. Pedag.
Rev. Tchèque de Neurol. et de Psychiat.
Ric. Psych.
- 2, 3, 4 *Riv. di Neurol.*
Riv. di Neuro-psiquiat., Peru.
 3 *Riv. di Psihol.*
Riv. Ital. di Endocrin. e Neurochir.
 2 *Riv. Patol. nerv. ment.*
Riv. Psihol. Norm. Pat.
- 2, 4 *Riv. Sper. Freniat.*
 1 *Rocz. Psychjat.*
 2 *Rorschach Res. Exch.*
- 1 *Schizofrenie.*
 2 *Schweiz. Arch. Neurol. Psychiat.*
Schweiz. Z. Psychol.
Schweiz. Z. Psychol. Anwend.
Skand. Arch. Psychol.
Sovet. nervropatol., psichiatri, psichoguguia.

Sovet. Psichoneurol.
Sovet. Psikhotekh.
Speech Monogr.

Tohoku Psychol. Folia.

- 2 *Tr. Am. Neurol. A.*
Tr. Beritov Inst., Tiflis.
Tr. Kostchenko Ment. Hosp., Moscow.
 2 *Trud. fiziol. Lab. Pavlova.*
Trud. tsentral. psikhoneurol. Inst.

Univ. Calif. Publ. Psychol.
Univ. Iowa Stud. Psychol.
Untersuch. Psychol. Phil.

- 3 *Z. angew. Psychol.*
Z. Arb. Psychol.
Z. Berufs. des Pflegepers.
Z. Individ. Psychol.
 2, 4 *Z. ges. Neurol. Psychiat.*
 3 *Z. Pädag. Psychol.*
Z. Parapsychol.
 2 *Z. Psych. Hyg.*
Z. Psychoanalyse, Tokyo.
 3 *Z. psychoanal. pädag.*
 2, 3 *Z. Psychol.*
Z. Psychother. med. Psychol.
Z. Tierspsychol.
 2 *Zbl. Neurochir.*
 1, 2 *Zbl. ges. Neurol. Psychiat.*
Zbl. Psychotherap.

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On the Psychopathology of Disseminated Sclerosis.

A brief review is given of the psychopathology of disseminated sclerosis, and the specificity and differential-diagnostic importance of the euphoria is emphasized.

A relatively well-examined, modern collection of cases is analysed.

47·3 per cent. of 330 patients developed mental symptoms. The neurologic symptomatology is stated and appears to have been comparatively equal for the psychonormal and the psychopathological groups, only the severe motor symptoms and the sphincter disturbances being most frequent in the psychopathological group (39·5 per cent. against 21·4 per cent., and 60·5 per cent. against 42·8 per cent. respectively). Psychiatric predisposition and premorbid mental abnormality were likewise a little more frequent in the psychopathological group.

Three patients died. The pathologico-anatomical findings were those usually made in the case of disseminated sclerosis.

The different mental symptoms and syndromes registered are stated and those

occurring most frequently pointed out. Euphoria was found in 33.0 per cent. of the total number of cases and in 69.2 per cent. of the psychopathological cases, dementia was found in 14.0 per cent. and 29.5 per cent. respectively, and euphoria combined with dementia in 8.5 per cent. and 17.9 per cent. respectively.

A parallel is demonstrated between the degree of the euphoria and that of the paralyses, as well as the frequencies of the sphincter disturbances and the spinal fluid changes. Further it is shown that the mental changes are early symptoms (41.6 per cent. at least developed within the first 3 years).

19.2 per cent. of the psychopathological patients were themselves aware of their mental symptoms.

A number of special mental pictures are mentioned. Three patients presented psycho-reactions of the exogenous type during their stay in this Department, two had previously experienced exogenous psycho-reactions, and one a schizophreniform psychosis of several years' duration, which is characteristic of disseminated sclerosis. This psychosis was cured completely.

(Authors' abstr.)

A Family with Alzheimer's Disease.

The author describes a family in which the father, the daughter and one son died from Alzheimer's disease and the remaining son suffers from mental deficiency.

(Author's abstr.)

On Delirium Acutum.

By means of a number of biochemical examinations in 5 patients with delirium acutum the writers have been able both to confirm certain observations previously made (increased urobilinuria, uremia) and to demonstrate characteristic changes of the concentration in the blood of two intermediary carbohydrate metabolites (pyruvic acid and citric acid) parallel with the clinical course of the acute delirium. The importance of the changes demonstrated is discussed; they are interpreted as disturbances of the aerobic carbohydrate metabolism, being especially compared to the knowledge of the intermediary carbohydrate metabolism acquired through enzyme research. It is emphasized that the metabolic disturbances demonstrated are not specific of delirium acutum, but that it is reasonable to suppose that they are of essential importance to the course of the disorder.

(Authors' abstr.)

Psychopathic Personality Traits. Terminological Considerations.

A short resumé is given of the patient material at the Asylum for Psychopathic Criminals in Herstedvester, illustrated by a summary of the diagnoses on admission during 1943 and 1944. The definition of the term psychopathy is discussed. The general tendency is thought to be in the direction of considering psychopathy as mainly a hereditary disease, and that Danish psychiatry has definitely decided to accept psychopathy as hereditary as opposed to the environmentally caused disturbances that should be called nervosism. It is emphasized that a boundary line such as this cannot be maintained, since the hereditary and environmental factors both enter, inextricably, into all personality defects. This opinion is illustrated by a review of case-histories. It is furthermore asserted that somatic factors, especially the consequences of organic brain diseases, frequently enter into the picture also, and that in many cases one must be content with deciding that organic disturbances are one of the factors that have caused the demonstrable personality defect.

A warning is given against using the expression psychopathy in the sense that excludes in advance the consideration of any but aetiological hereditary factors. The more nearly neutral expression "personality defect" is proposed instead. This opens a possibility of a fruitful discussion of the aetiology of individual cases and, thereby, also of suitable therapeutic measures.

(Author's abstr.)

SUPPLEMENTUM.

1945-46.

Pain in the Distribution-Area of the 4th Lumbar Root. von Reis, G. No. 36

*A Comparison of 1,459 Shock-Treated and 969 Non Shock-Treated Psychoses in Norwegian Hospitals. Dedichen, H. H. No. 37

A Comparison of 1,459 Shock-Treated and 969 Non Shock-Treated Psychoses in Norwegian Hospitals.

A study has been undertaken of 1,087 patients given convulsion treatment (cardiazol or pentozol), of 243 patients given insulin treatment, of 129 patients given summation treatment, and of 969 patients who served as controls. An account is given of the principles governing the selection and composition of this material with reference to the duration of the disease, the age and sex of the patients, and other factors.

The material is classed in three groups, as it was considered of importance to keep the most pure schizophrenic and manic-melancholic forms of disease separate from the more mixed forms.

After it is pointed out that the treated material and the controls are so alike that they can fairly be compared with each other, statistical calculations are undertaken.

As the duration of the disease before the institution of treatment plays so important a part that it is necessary always to class the material in syndrome groups and durational groups, the numbers in each column often become so small that they afford little opportunity for drawing conclusions by direct calculation. Standard calculations have therefore been undertaken, several durational groups being added to each other so as to provide bigger figures.

The investigations show that in Group I with hebephrenic, paranoid or katatonic syndromes without manic-depressive or confusional trends the percentage of remissions is considerably higher among the pentozol-treated patients than among the controls. When the disease has lasted less than a year, the difference is 6.6 times the standard error, whereas it has fallen to less than once the standard error when the disease has lasted from 1 to 5 years before the institution of treatment.

In Group II (hebephrenic, paranoid or katatonic syndromes with manic-depressive or confusional trends) there is still a marked difference with regard to the percentage of remissions for the convulsion-treated patients and the controls when the duration of the disease was comparatively short. This difference is 5.7 times the standard error when the disease had lasted less than 1 year, and ± 0.5 times the standard error when the disease had lasted from 1 to 5 years before the institution of treatment.

On the other hand, in Group III (manic-melancholic syndromes) there is no difference in the tendency to remission between the pentozol-treated patients and the controls.

It would thus appear that, from the statistical point of view, the treatment achieves the best results in forms of the disease in which the prognosis is otherwise worst. For the manic-melancholic syndromes the prospect of a spontaneous remission is so good that the task of convulsion treatment is only to shorten the course of the disease. The observation period for the shock-treated patients was at least 1 year, and for the controls, fully 10 years. Social remissions were accepted as such only when they had lasted at least half a year. Some of the treated patients underwent a follow-up examination after 4 years. In Group I the remissions had been maintained in 76 per cent., 12 per cent. of the patients had relapsed and 12 per cent. could not be traced. In Group II the corresponding percentages were 69, 12 and 19. In all these cases the disease had lasted less than a year before the institution of treatment. When the disease had lasted from 1 to 5 years before the institution of treatment, 61 per cent. of the patients in Group I had maintained their remissions, and 24 per cent. had relapsed. The corresponding percentages for Group II were 78 and 7 respectively.

The follow-up examinations also showed that some of the patients not achieving a remission in response to the treatment did so later on.

This study also showed that in Group I the reaction to the treatment was somewhat better as the patients were older. The sex of the patient does not seem to matter in this respect. It is possible that the treatment is more effective when the outbreak of the disease can be referred to a precipitating factor than when this is not the case. This is so both in Group I and in Group II. In Group I, when the disease has lasted less than a year, it would seem that the prospect of the treatment being successful is better when the onset of the disease has been acute than when it has been insidious. Earlier attacks of the disease do not seem to influence the

effects of the treatment. The present material does not warrant the drawing of conclusions with regard to the significance in this field of body structure, a prepsychotic mentality and a hereditary taint. There follows a detailed account of each group. In Group I it would seem that the prognosis is more or less the same for the paranoid and katatonic syndromes, whereas the fate of hebephrenics seems to be worst both among the patients given convulsion treatment and among those serving as controls. Influence phenomena, whether they occur by themselves or in association with a paranoid syndrome, do not seem to make the prognosis appreciably worse.

Certain syndromes not fitting into any of the three main groups are discussed by themselves. It would seem that diseases of the basal ganglia constitute a special contra-indication to convulsion treatment. The special problems arising in connection with women approaching the menopause, with its proneness to anxiety and an oscillating blood pressure, are discussed in detail, and modifications in the technique of the treatment of such patients are described. The complications of convulsion treatment, notably fractures, pulmonary ailments and amnesic syndromes following the treatment are discussed in detail, and the preventive measures calculated to prove effective are mentioned. The number of the patients given insulin and summation treatment being very small, the account given of them is quite brief. Considerable attention is, however, paid to the complications arising from these treatments.

(Author's abstr.)

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The Electroencephalogram and Psychophysiological Regulation in the Brain.

The paradoxical association of relatively large amplitude alpha $10 \pm$ per second activity with a relatively low level of waking cerebral function is attributed to the inhibitory effects of subcortical $10 \pm$ per second pacing of activity in the cortex and to associated autonomic effects causing cerebral constriction. On the other hand, the association of fast activity with cortical excitation, metabolite (CO_2) production, and fast activity in cholinergic nerves accounts for associated vasodilatation. Thus, by the opposed effects of fast vs. $10 \pm$ per second slower activity, cortical and subcortical mechanisms may regulate one another. This may provide a homeostatic mechanism by which excitation in the cortex is normally prevented from producing excessive discharge or from self-perpetuation. Underactivity, overactivity, or imbalance of these functions would account for the EEG and autonomic patterns seen in many abnormal mental conditions.

(Author's abstr.)

Effects of Sedative Drugs on the Electroencephalogram.

A study is presented of the electroencephalographic effects of small oral doses of the usual sedative drugs (phenobarbital, sodium amytal, nembutal, seconal, paraldehyde, chloral) in 10 normal subjects with normal EEGs.

Data on 45 psychiatric patients who had received oral sedation within 24 hours of the electroencephalographic recording are compared with a control group of 45 psychiatric patients who had received no sedation. Patients with a diagnosis of epilepsy or of organic central nervous system disease were excluded from this study.

The results of the two methods of study are in essential agreement and lead to the following conclusions:

1. The commonly used barbiturates given orally in small doses may change a normal to an abnormal EEG. Paraldehyde and chloral do not cause prolonged alterations in the normal EEG under the conditions of this study.

2. The change occurs in an estimated 35 per cent. of individuals with normal electroencephalographic tracings. This change is of a nature and degree to require re-evaluation of studies on patients receiving sedatives.

3. The change usually consists of an increase in fast activity, but it may consist of an increase in slow activity. In either case, the direction of the change is more constant for the individual than for the drug employed.

4. The factors which influence the appearance of an abnormal EEG after sedation are individual susceptibility, drug employed, time interval and dosage. The highest percentage of abnormal records occurs in the patients who received 0.3 gm. or more of barbiturate 12 to 14 hours before the EEG.

(Author's abstr.)

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Electroencephalographic Studies of Psychopathic Personalities.

Records showing frequencies lower than 8 a second or an abundance of waves slower than 8 a second in the frontal leads, regardless of amplitude, were considered abnormal. This is essentially in accordance with the criterion of Gibbs, Gibbs and Lennox. The record of one patient was considered abnormal during overbreathing only.

All the abnormal records fell under the type of electroencephalograms usually called "pathologic record of undetermined type." 53 per cent. of the patients had abnormal records. It was possible to divide these pathologic records into two types, namely, those of average amplitude, 5 to 7 a second activity, and those of low voltage, slower than 5 to 7 a second activity. A third pattern—low voltage, fast activity—was frequently encountered, but it was not considered definitely abnormal.

The majority of the abnormal records were those containing sufficient 5 to 7 a second activity of low average amplitude in the frontal and parietal leads to be considered beyond the limits of normal. Some 5 to 7 a second activity is commonly found in the frontal records of normal subjects, but it is unusual in the parietal leads. Any considerable amount of it in the frontal and parietal leads must certainly be considered abnormal.

(Authors' abstr.).

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CHICAGO NEUROLOGICAL SOCIETY.

- Penicillin Therapy for Spina Bifida. *Walker, E. A., and Johnson, H. C.* . . 122

Effects of l (+) Glutamic Acid and Other Agents on Experimental Seizures.

In an attempt to measure in the laboratory the anti-convulsant value of glutamic acid, this substance was tested by a number of technics for investigating the potency of anti-convulsant agents. In a wide range of single large and repeated small doses, and in a variety of species, the amino acid was found ineffective in the prevention or modification of electrically or chemically induced convulsions. Glutamic acid failed to elevate the normal seizure threshold, did not modify the character of the convulsion produced by supramaximal currents, and had no effect on the electric shock threshold lowered by cellular hydration. Glutamic acid was also without effect on metrazol-induced electroencephalographic dysrhythmias of the *petit mal* type. In addition, it did not alter the resting electroencephalogram or the electroencephalographic response to single cortical shocks.

Inasmuch as diphenylhydantoin, phenobarbital, Tridione, dimethyl-N-methyl barbituric acid and benzimidazole give laboratory evidence of anti-convulsant potency with one or more of the technics employed, it is suggested that if further clinical work substantiates the efficacy of glutamic acid in treatment of *petit mal* and psychomotor epilepsy, the mechanism of its action is likely to prove considerably different from that of the known anti-convulsant drugs in clinical use. Indeed, one would not be able to predict from present laboratory screening methods that glutamic acid has anti-convulsant potency or value. (Authors' abstr.)

Sensation of Electric Shock Following Head Injury.

A series of 30 cases of head injury is presented in which the phenomenon of sensation of electric shock was perceived in various parts of the body on flexion of the neck. Multiple etiologic factors may be operative; the hypothesis of concomitant concussion of the cord and of a special cerebral origin are discussed. The pathologic process is unknown, demyelination of spinal tracts and meningeal scars being considered as likely factors; the process, however, is self-limited and reversible so far as the phenomenon is concerned. (Author's abstr.)

AUGUST.

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Electric Shock Therapy of Elderly Patients.

The results of electric shock therapy in a group of 53 patients aged 65 or more are reported. The difficulties in diagnosis, the contra-indications to treatment and the complications and effectiveness of therapy are discussed. Three cardinal problems have emerged from this study:

1. The differentiation of true intellectual decline and other types of psychoses of the senium, especially depression, must be made. Suggestions for making this distinction are offered.

2. The significance of an impaired cardiovascular system in the patient with serious mental illness must be evaluated in terms of what the future holds for the patient with and without treatment.

3. When a diagnosis other than senile dementia can be made in a patient over 65, especially that of depressive, manic or paranoid psychosis, electric shock therapy should be considered. The only contraindications should be extreme defects in the physical state, particularly in the cardiovascular system.

(Authors' abstr.)

Pattern of Metabolic Depression Induced with Pentothal Sodium.

In this investigation on the pattern of the action of pentothal sodium on the brain, it was possible to show that the cerebral hemispheres are the areas first involved in the depressant action of this drug, because of the peculiarities of the anatomic venous cerebral return, which in the majority of patients directs most of the blood from the cerebral hemispheres either to the right or to the left internal jugular vein, and a major portion of the blood from the basal ganglia to the opposite vein. A total of 36 observations were made on 12 subjects under pentothal anesthesia. Of 22 observations, made at the lighter levels of anesthesia, the results may be divided into two groups. In 9 of the subjects the arteriovenous difference on one side was more depressed than that on the opposite side, and in the 3 remaining patients the arteriovenous differences were similar on the two sides. Further evidence supporting the differences between the values for the right and the left internal jugular vein is obtained from the data for glucose and lactate, for in the same 3 patients in which the arteriovenous oxygen differences were always within the experimental error the arteriovenous glucose and arteriovenous lactate differences exhibited a similar agreement, while in the other 9 patients the paired results did not show a similar precise concordance. With deeper anesthesia the subcortical parts became more involved, and the paired arteriovenous oxygen differences for the two sides were greatly depressed and within the experimental error in all but 2 of 14 observations. These results indicate that oxidation is not decreased to the same extent in all parts of the brain at the lighter levels of barbiturate anesthesia, but that the cerebral hemispheres are the areas of the brain preponderantly involved in the depressant action of the drug. The other parts of the brain gradually suffer an increasing inhibition of oxidation as the deep levels of pentothal anesthesia are produced.

(Authors' abstr.)

Effects of Antibiotic Substances on the Central Nervous System.

Clinical and experimental studies indicate that penicillin may produce convulsive manifestations. During systemic administration for conditions other than primary ones of the central nervous system, the electroencephalogram was found to be abnormal in more than 60 per cent. of a series of 51 patients. Control records taken before and after penicillin therapy usually showed normal tracings. Large doses of penicillin injected intrathecally in man or monkey may give rise to convulsions, followed in some cases by coma and death. The application of as little as 500 international units to the cerebral cortex of the macaque monkey may induce epileptic attacks.

Streptomycin in cats and monkeys applied to the cerebral cortex in doses of 1,250 units induced convulsive manifestations in 30 per cent. of the animals. Electroencephalographic records at such times showed slow waves and spikes, with subsequent decrease of cortical activity lasting for $1\frac{1}{2}$ to 3 hours. Cisternal injection in the monkey of 2,500 units of streptomycin induced signs of severe cerebellar dysfunction.

Streptothricin applied to the parietal cerebral cortex in doses of 5,000 to 10,000 units produced clinical and electroencephalographic convulsive manifestations. Although these phenomena usually disappeared spontaneously in 2 to 3 hours, in two monkeys they persisted for 2 weeks. At necropsy the brains of these animals showed extensive softenings with perivascular petechial hæmorrhages.

Actinomycin injected into the cerebral cortex or the cisterna magna in a dose of 1 mg. after a latent period of 9 hours produced severe prostration, fasciculations and convulsions, with death in 1 to 7 days. At the site of injection into the cerebral cortex a severe necrobiotic reaction with edema and petechial hæmorrhages was found.

Clavacin when injected into the cerebral cortex in doses of 5 to 10 mg. induced clinical and electroencephalographic manifestations of convulsive phenomena with a marked decrease in spontaneous cerebral activity.

There appears to be a wide margin of safety between the antibiotic concentration of penicillin and streptomycin and the convulsive threshold for those drugs. Such does not appear to be the case for streptothricin, clavacin or actinomycin. Although penicillin has few toxic reactions, if it is given in excessive amounts in the cerebrospinal fluid severe neural sequelæ in the form of radiculitis or convulsions may develop.

(Authors' abstr.)

Dominant Brain Wave Frequencies as Measures of Physico-chemical Processes in Cerebral Cortex.

Engel and associates note that their method "may give a slightly false impression of the distribution of wavelengths greater and less than the dominant one," since they do not measure wavelength but take as the frequency the total number of waves per second. The authors' main criticism is that the method is misleading in its misuse of the concept of the dominant frequency itself if one considers waves of similar length arranged in sequences as reflecting physico-chemical processes in the cells. Engel and his collaborators are concerned with the effects of physiologic agents on the electroencephalogram, and, while empiric changes are of course brought out by their method, it seems unfortunate to employ a tool which by its very nature, through its definition of "frequency," masks the possibility of a rational interpretation of rates of events going on in the brain.

The dominant frequency as studied with the Brazier method is the frequency which the authors have used in their earlier studies of the effects of physico-chemical agents on the electroencephalogram. It would, for example, be quite impossible on theoretic grounds to calculate meaningful energies of activation of enzyme steps in the carbohydrate cycle with the method of Engel and associates, since their frequencies, including their dominant frequencies, are composed of waves of different lengths and the independent variable, the per cent. time alpha, contributes to the determination of their actual frequencies *per se*.

This may be illustrated by a hypothetical example. Suppose one has a record composed of continuous and uniform sine waves of 10 per second produced by a piece of electrical apparatus. There would thus be only one frequency, the dominant one determined by the properties of the apparatus making the signals. One may now consider an equal length of record consisting of 5-second strips of the same 10 per second waves, alternating with equal intervals with no waves at all. Such a record could be made artificially by turning the apparatus that makes the waves on and off at 5-second intervals. The dominant rhythm in both these records, according to the authors' studies and to the Brazier method, is clearly 10 cycles per second; the dominant rhythm according to the Engel method is 10 per second in the first record and 5 per second in the second record, and from this one would be led to the erroneous conclusion that the apparatus producing the waves with a frequency of 5 per second was operating at half its former rate.

For the reasons the authors have discussed, the measurements of Engel and associates cannot reflect the rates of changes of kinetic processes in the brain, and in effect they mask these processes. The Engel spectrum is a graphic representation of gross qualitative changes observed in the records, and as an analytic instrument it has all the limitations of the delta index, which the authors have described and have used as a purely empiric expression of the numerical representation of the magnitude of slow-wave activity in the electroencephalogram.

Quantitative changes with physiologic variables of bands of waves of equal length (e.g., the alpha waves) have led to significant insight into the chemical kinetics of the brain, and further studies along these lines hold promise. Much of the value of this type of investigation may be lost unless the limitations of the methods used are borne in mind. (Authors' abstr.)

ARCH. PATH.

VOL. XLII.

AUGUST, 1946.

- *Cerebral Concussion: Histochemical Demonstration of Nucleases in the C.S.F. Spiegel, E. A., et al. 175

Cerebral Concussion: Histochemical Demonstration of Nucleases in the Cerebrospinal Fluid.

Incubation of buffered specimens of cerebrospinal fluid from patients who had undergone cerebral concussion with sections of cats' cords produced tigrolysis in the anterior horn cells, while similar treatment of the sections with buffered specimens of cerebrospinal fluid from normal persons or with buffered Ringer's solution failed to produce such an effect.

The findings point to the importance of enzymatic substances in the genesis of chromatolysis following cerebral concussion.

The nucleoproteins of the nerve cells go into solution at the hydrogen ion concentration prevailing in the normal central nervous system *in vivo*. When sections of spinal cords are incubated with various fluids, these fluids must be acidified for demonstration of Nissl bodies. (Authors' abstr.)

ARCH. PSICOL. NEUROL. PSICHIAT.

VOL. I.

1940.

- Psychopathology of Form Perception. Glueck, G. 603
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1941.

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Objectivity, Stratification and Conspicuousness in the Perceptive Organization of Figure and Ground. Metelli, F. 831
*On Postencephalitic Dementia. Brambilla, S. 842

Electroencephalography: Nature and Psychophysiological Significance of the Electric Phenomena of the Brain.

After a discussion of the basic principles underlying electroencephalographic techniques, the author describes the characteristics of the normal EEG in men and animals, individual differences, the effects of sensory stimuli, electric activity of the brain during sleep, the relationship between electric activity and mental activity, the effects of drugs, and relation of the EEG to temperature, circulation, and metabolism. A critical analysis of the results in the literature suggests the following conclusions: the alpha waves are the expression of synchronic "pulsations" of a great number of cortical neurons; the states of excitement (sensorial stimuli, psychical activity) disturb this synchronism and transform the

alpha rhythm into beta rhythm. Delta waves, the origin of which is still obscure, appear with a diminished cerebral activity. The frequency of the rhythms is consequently related to major or minor cerebral activity. The modifications of the electroencephalograms as an effect of psychical activity are due to sensorial or affective components. (Psychol. abstr.)

New Contributions to Electroencephalography.

After a general consideration of the topic, the author describes the apparatus used in the psychology laboratory of the Catholic University of Sacro Cuore in Milan. Mention is made of an electromagnetic oscillograph with ink-writing pen, also constructed in the same laboratory. Sample records are reproduced. There is a discussion of the principal theories of the nature and origin of alpha waves. The factors of frequency, form and amplitude are examined, and this examination is completed by a systematic study on the lack of synchronism of the waves which originate from different parts of the brain. The author offers the hypothesis of a unit centre for the origin of the alpha waves, and gives an interpretation of the function and the nature of this centre. (Psychol. abstr.)

On Postencephalitic Dementia. The Method of Rorschach Applied to the Study of Postencephalitic Parkinsonism.

The author examined with this test 30 adult subjects affected by postencephalitic parkinsonism. The conclusion is that effectivity, some functions of the intellectual process (resistance to mental work, capacity of concentration and attention), perception and the higher logical processes are involved. This is shown by such typical signs as the following: small number of answers, high percentage of badly perceived forms (F per cent. often with negative values), reduction of kinesthesia and chromesthesia, and tendency to stereotypy. These results do not entirely agree with those of Veit, the only author who has applied the Rorschach test to the study of postencephalitic parkinsonism. (Psychol. Abstr.)

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VOL. V. 1944.

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VOL. VI.

1945.

- *Problems of the Frontal Lobe. *Porta, V.* 5

Problems of the Frontal Lobe.

The author describes the case of a wounded patient with a frontal lesion whose symptoms became apparent 10 days after the accident and were of short duration. The syndrome was characterized by severe astasia-dysbasia, dysmetric and asynergic symptoms in the trunk and limbs, loss of motor initiative and emotional contact, spatial disorientation, amnesia and enuresis. Various interpretations of frontal lobe function are discussed, opposite trends represented by Goldstein's holistic approach and Kleist's localizations are evaluated, and the neuropsychobiological basis of prefrontal lobotomy is analysed. (Psychol. abstr.)

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- War Neuroses Among Returning Soldiers. *Kolb, A. C.* 89

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 Narcoanalysis and Sub-shock Insulin Treatment of Anorexia Nervosa. *Gottesfeld, B. H., and Novais, A. C.* 448

Trauma and Neurosyphilis.

The authors report 13 cases in which cranial or spinal injuries probably played a significant role in the development or aggravation of several forms of neurosyphilis; from the total number of cases, 3 refer to mesenchymatous and the rest to parenchymatous forms (5 cases of tabes and 5 of general paresis). From their own observations and from references in medical literature, the authors can state the following conclusions:

1. Trauma can act (a) as an aggravating factor of a pre-existing, clinically recognized neurosyphilis; (b) as a precipitating factor of a latent, asymptomatic neurosyphilis; (c) as a localizing factor of a pre-existing syphilis which had not, till then, affected the central nervous system.

2. Each case must be judged on its own merits. The points which estimate the connection between trauma and neurosyphilis are: clinical conditions before trauma, circumstances involving the trauma, site of the injury, severity of the trauma, chronologic interval between trauma and beginning of the symptoms, bridging symptoms, shortening of the incubation period and fast development of the disease.

3. The aforementioned elements are sufficient to consider the trauma as an aggravating or as a precipitating factor. If the normality of the cerebrospinal fluid could be tested just before or just after the injury and, some months later, the beginning of the clinical symptomatology became apparent and was confirmed by the positiveness, in the spinal fluid, of the reactions for syphilis, the trauma must be considered a localizing factor. The authors' cases fulfil these conditions, and perhaps they are the only ones recorded in medical literature.

4. The mode of action of trauma on the development of parenchymatous neurosyphilis may be explained by localization of the *Treponema pallidum* in inflamed areas; (b) connections between trauma and immunity in neurosyphilis; (c) traumatic rupture of the hematoencephalic barrier; (d) relation between the germ's electric charge and the permeability of the barrier; (e) influence of the traumatic shock of the sympathetic nervous system on the development of parenchymatous neurosyphilis.

5. Whatever the mode of action of the trauma, the medico-legal aspect is the same. The effects are imputable to trauma, but syphilis will always be a pre-existing concausal element. In the juridical valuation of the injury, the assessor must fix the compensation for incapacity according to the role the trauma played; it will be greatest if the injury localized the syphilis on the nervous system, and it will be least if the trauma was only an aggravating factor. (Authors' abstr.)

Prefrontal Leucotomy.

The author discussed the different techniques for leucotomy, especially that of Freeman Watts.

He has devised a "lobotome" for a three-fold purpose—to ascertain the reference marks, sever the fibres and leave iodine-oil in the transection tract. The instrument consists of a trocar slightly flattened to take the shape of a regular leucotome and having one of the ends sealed. In one of the cutting edges near the blind end there are 4 small holes, 1 centimetre apart. Through the free end a syringe may easily draw fluid and inject contrast media into the transection surface.

To secure a more accurate placing of the transection, the writer has recently followed the technique of transfixing the falx and both frontal lobes with a stylet inserted through the burr holes. He also recommends having a pneumoencephalography systematically performed before operation in order that the ventricles be accurately localized. He does not present any worth while results as the interval is too short.

All the patients operated on were chronic cases who had undergone all the accepted treatments, including leucotomy. (Author's abstr.)

BOLL. D. SOC. ITAL. D. MED. E. IG. TROP.

VOL. IV.

1944.

Lavage of Lateral Cerebral Ventricles in Therapy of Intracranial Suppuration with Open Fractures. *Manfredonia, M.* 727

BRAIN.

VOL. LXIX.

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 *The Development of the Substantia Nigra. *Cooper, E. R. A.* 22
 *The Development of the Human Red Nucleus and Corpus Striatum. *Cooper, E. R. A.* 34

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The Development of the Nuclei of the Oculomotor and Trochlear Nerves. Cooper, E. R. A.	50
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The Development of the Substantia Nigra.

1. The substantia nigra is developed by a ventrolateral extension of cells from the characteristic mid-ventral proliferation in the basal lamina of the mesencephalon.
2. It is first seen in the 22 mm. embryo as a peripheral crescentic strip of cells continuous with the ventrolateral angle of the mid-ventral proliferation.
3. At the same time a narrow band of fibres appears on the superficial aspect of the nigral crescent. These are descending fibres from the cerebrum, and with the nigra they form the peduncle of the mid-brain.
4. From the outset there is a close association between the substantia nigra and the descending cerebral pathway.
5. By the 30 mm. embryo stage, the nigral crescent is separated into groups by the descending fibres. Characteristic medial and lateral groups are soon formed at the medial and lateral extremities.
6. By the eleventh week (6.0 cm.) the nigra is disposed into two strata, corpus and cauda, the former lying deep to the latter with cerebral fibres between them. Medial, lateral and intermediate groups are recognizable in the corpus, and fibres extend between corpus and cauda and penetrate from the nigra into the cerebral pathway.
7. In the 9.0 cm. foetus the pyramidal shape of the substantia nigra is evident. The apex lies in the subthalamus and continues into the intermediate part of the corpus. This is soon flanked by the medial and lateral columns. The cauda lies along the ventral part of the nigra. The base is formed by the columns of the corpus and extends into the pons.
8. At mid-term a new nigral stratum appears. It will be referred to as the caput. It lies on the dorsal aspect of the corpus and is separated from it by cerebral fibres. It links the medial and lateral groups of the corpus and projects aberrant groups into the tegmentum. The caput and cauda are present only in the mid-brain portion of the substantia nigra; the corpus extends to the subthalamus and pons.
9. At the eighth foetal month a rich plexus of fine myelinated fibres pervades the nigra, and fibres extend from it into the crus and tegmentum, and into the subthalamic nucleus.
10. After birth the nigra retains its foetal architecture, but enlarges and attains its maximum size in childhood.
11. Minute black granules are first seen in some of the nigral neurones at mid-term. Thereafter they increase, but not all the neurones contain them. After birth granular cells are numerous.
12. By dissection the pyramidal shape of the substantia nigra is confirmed.

(Author's abstr.)

The Development of the Human Red Nucleus and Corpus Striatum.

1. The human red nucleus develops as a migration of cells from the mid-ventral proliferation of the mesencephalic basal lamina.
2. These cells migrate towards, and become associated with, cerebello-mesencephalic fibres (brachia conjunctiva) which reach the mid-brain in the embryo of 19 mm. length (6½ weeks).
3. A collection of cells, situated among the cerebello-mesencephalic fibres at the base of the cerebellar outgrowth is seen in the 29 mm. embryo (8 weeks). These cells develop into the dentate nucleus, which appears in series with the red nucleus and is linked to it by tiny groups of cells in the dentato-rubral (cerebello-mesencephalic) fibre pathway. The possibility of a tegmental origin of the dentate nucleus is suggested.
4. Grouping of neurones in the red nucleus begins in the 4.0 cm. foetus (9 weeks).
5. Minute brown granules appear in the rubral neurones at mid-term. Later a diffuse brown coloration distinguishes the cells.
6. The corpus striatum arises as a thickening of the lateral wall of the cerebral vesicle in the 10 mm. embryo (5 weeks).

7. In the 22 mm. embryo (7 weeks) descending cerebral fibres separate the corpus striatum into medial (caudate) and lateral (lentiform) parts.

8. In the 7.0 cm. foetus (12 weeks) the lentiform nucleus is subdivided into putamen and globus pallidus. (Author's abstr.)

BRIT. J. PSYCHOL.

VOL. XXXVII.

SEPTEMBER, 1946.

*Some Qualitative Observations on Verbal Memory in Cases of Cerebral Lesion.

Zangwill, O. L. 8

*An Examination of the Varying Effect of Certain Stimuli upon the Alpha Rhythm of a Single Normal Individual. Harrison, J. M. 20

The Colour Sense of Fijian Natives. Geddes, W. R. 37

Some Qualitative Observations on Verbal Memory in Cases of Cerebral Lesion.

1. Some qualitative observations on verbal memory in cases of cerebral lesion are described. These have reference to (a) the auditory-verbal memory span; (b) rote learning, and (c) recall of short stories (substance memory). Special attention is given to the results in cases with disorders of language and of memory respectively.

2. An impairment of memory span for verbal material and severe difficulties in rote learning were consistently found in cases with language disabilities associated with focal lesions of the speech areas. It is pointed out that these defects may long outlast the grosser symptoms of an acute aphasic disorder.

3. Cases of pronounced impairment of general memory (amnesic or Korsakow syndrome) were found to have intact verbal memory span but grossly impaired verbal learning. Substance recall was in general very defective in these cases and fabrication was often marked.

4. It is suggested that the defect of verbal learning in dysphasic cases is syntactical in nature and closely associated with the primary disorder of symbolic formulation and expression. In amnesic cases, on the other hand, it is argued that the defect is independent of language, and due to a generalized inability to organize consecutive responses into a unitary habit.

5. It is pointed out that both rote and substance recall are equally affected in the amnesic syndrome, but that the latter is often well preserved in dysphasic conditions. Some implications of this finding for the theory of memory are briefly considered.

6. The available evidence suggests that some impairment of verbal learning is very common in organic cases irrespective of the precise nature and localization of the lesion. A tendency to stereotyped error has been noted especially in cases with lesions of the frontal lobes.

7. The bearing of the results on practical problems of diagnosis, assessment and re-education in cases of brain injury is briefly indicated. Some suggestions for future research are also mentioned. (Author's abstr.)

An Examination of the Varying Effect of Certain Stimuli upon the Alpha Rhythm of a Single Normal Individual.

A single normal subject has been repeatedly examined on the EEG and the effect of certain types of attention and emotional stimuli systematically examined. Inter-correlations of the stimuli are small and the scatter of the data about the respective means is large, with the exception of suppression of the alpha rhythm associated with visual activity. The effect of a mental arithmetic problem upon 27 cases of a small sample of normal individuals has been compared with the results of the present experiment. The following conclusions may be tentatively drawn from the results. It should be emphasized that these conclusions are based on work with this subject only, and cannot be generalized without further individual investigations:

- (i) There is a low positive correlation between the degree of suppression associated with mental arithmetic and concentration problems. This appears to indicate the existence of common mental (or neural) activities for these two tasks. The lack of correlation between these two tasks and the immediate memory span test suggests that the attention associated

- with immediate memory processes is to be distinguished from that involved in arithmetical problems and indicates specific types of attention.
- (ii) Suppression of the alpha rhythm is associated with focusing of the attention, but is an unreliable guide to the degree of focusing. This indicates lack of direct connection between attention and the amplitude of the alpha rhythm.
 - (iii) The amplitude of the alpha rhythm is an unreliable indicator of activity of the sympathetic branch of the autonomic nervous system.
 - (iv) Suppression of the alpha rhythm is not reliably connected with the degree of conscious emotion. The results indicate that a large emotional response is associated with a greater degree of rhythm suppression than either an average or small emotional response, but the difference between the means of these three values is not statistically significant. A small negative correlation exists between associative reaction times and degree of suppression.
 - (v) The neural processes directly responsible for suppression of the alpha rhythm take place below the level of consciousness since the subject is unable to state the degree of suppression associated with a particular stimulus.
 - (vi) In solving problems in mental arithmetic the variation in rhythm suppression shown by the single individual, who served as the main subject in this experiment, is almost as wide as that found in 27 different subjects. With the latter both the standard deviation and the mean were slightly greater; but the increases were so small as to be statistically non-significant. (Author's abstr.).

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*Performance of Brain-damaged Cases on a Memory-for-Designs Test.

Graham, F. K., and Kendall, B. S. . . . 303*Performance of Brain-damaged Cases on a Memory-for-Designs Test.*

A memory-for-designs test, requiring less than 10 minutes to administer, and consisting of 15 designs, presented singly, was given to a group of 70 brain-damaged patients and 70 controls. The controls were also a patient population and had the same age distribution and educational and occupational background as the experimental group. An additional group of 60 controls and 10 experimentals, as well as 16 cases above the upper age limit of 60, was used for cross-validation.

1. Experimental and control groups showed significant mean differences in score on the test.

2. Impairment on the test, indicated by a score above a critical value, was rare in the controls and analysis of the individual cases indicated that it occurred only with feeble-mindedness, where concomitant brain damage is likely, or severe psychiatric illness. Psychiatric cases could generally be differentiated by qualitative indicators not included in the scoring system.

3. Impairment occurred in only 50 per cent. of the experimentals. Although additional factors such as tremor, number of reversals, etc., differentiated some of those scoring low, a considerable number still remained whose performance was in every observed respect like that of the controls.

4. Unusually low correlations were obtained between test score and age and test score and intelligence, indirectly measured by school grade completed and vocabulary. This should make the test an especially valuable addition to a battery for detecting brain damage.

(Author's abstr.)

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Use of the Shipley-Hartford Test in Evaluating Intellectual Functioning of Neuropsychiatric Patients.

The Shipley-Hartford Retreat Test "was given to 977 randomly selected neuropsychiatric patients at a service hospital. Of this group, 134 were also given the Wechsler-Bellevue Intelligence test. The following conclusions seem warranted: (1) The Shipley-Hartford test can be used as a rough estimate of functional intelligence. (2) The distribution curve of 'original' intelligence of neuropsychiatric patients is very similar to that obtained by Wechsler in a sampling of the adult population. (3) A large proportion (62 per cent.) of neuropsychiatric patients tend to show a lowering of efficiency in their intellectual functioning." (Psychol. Abstr.).

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Connections of the Cerebral Cortex. I. The Albino Rat. B. Structure of the Cortical Areas.

The identification and arrangement of the cortical areas of the albino-rat have been determined on the basis of cell- and myelin-stained material sectioned in various planes. The picture presented by each area has been characterized and illustrated by means of sample strips taken perpendicular to the surface. Some 40 cortical areas are distinguished. Individuality and boundaries of the areas were determined on the basis of appearances alone. The identification, expressed here in Arabic numerals as proposed by Brodmann, has been made with regard to accumulated evidence on connections and probable evolutionary patterns of the cerebrum. It is believed that the parietal cortex has been subdivided in a manner that will enable areas to be equated with those of higher forms. Thus, 3, 1 and 2 occupy a prominent place, while 7 and 39 are, as expected, smaller. Motor, premotor and frontal areas have been distinguished and the frontal region has been divided into polar (10) and basal (8, 11) areas. The auditory cortex (41) is identified, changing radically the pattern formerly claimed for the temporal region of lower animals. The primary sensory receptive cortices are seen to dominate the cerebrum. Sensory associative cortices form marginal strips or fill in chinks. The frontal area is poorly developed. On the other hand, the limbic lobe is markedly developed and presents numerous subdivisions.

The study of the myelin pattern of the cortex has been instructive. Attempting to explain significance of the various categories of fibers, instead of regarding them merely as a means of distinguishing areas, has resulted in the establishment of a number of generalities. The fact that in the rat a large bulk of the interareal associational fibers are intracortical is an important one for cortical analysis.

The plan here established has been compared with the studies of others on related forms.

A plan has been devised to explain the differentiation of cortical areas, the large number that appear in the rat and the conservatism of this arrangement.

The place which this survey has in the project of cortical study under way is discussed. (Author's abstr.)

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Experimentally Induced Convulsive Reactions of Laboratory Rats. I. A Comparative Study of the Immediate Reactions.

The conclusions derivable from the experimental observations described in the present study are summarized as follows:

1. The essential motor pattern of abnormal behavior evoked in some rats by noise-fright stimulation can also be evoked in the same animals by direct electrical stimulation of the brain.
2. The essential motor features of the noise-induced abnormal behavior pattern can be produced by electrical stimulation in rats which do not easily react to the noise-fright situation with the NF-3 or NF-4 type of response.
3. However, the electrically induced noise-fright pattern is suggestively more frequently produced in rats which do react with the NF response to the noise-fright situation.
4. Vigorous running is not a necessary precursor of the convulsive phase of the electrically induced NF pattern and of the ensuing passive, hypokinetic state of the reaction.
5. Since the electrical stimulus lasts only .2 second and since the convulsive phase of the ES-NF-4 pattern is immediately precipitated in some cases, the motor aspects of the abnormal behavior pattern may occur in the absence of any psychologically significant state of fear.
6. Inasmuch as the ES-NF response is always evoked by an electrical voltage less than that necessary to produce a maximal generalized convulsion, the ES-NF pattern represents a reaction to an abnormal but not maximal neurophysiological stimulation. In view of the motor similarity of the ES-NF and NF patterns, it is strongly suggested, therefore, that the NF response is also a reaction to an abnormal but not maximal neurophysiological stimulation.
7. The pattern of the motor expression of the NF reaction in the rat is similar to the motor symptoms of experimental catatonia described as occurring in many other animals following doses of bulbocapnine as well as following other physical and chemical alterations of the internal environment of the animals.
8. The symptoms of catatonia observed following the noise-induced acute behavior reaction last for a significantly longer time than the catatonic symptoms demonstrable after an electrically induced acute NF-4 response. This relatively longer duration of the NF catatonic symptoms is not, therefore, produced simply by the neuromuscular expression of the motor pattern of the response, since the catatonia of the ES-NF-4 reaction in which the same motor pattern may be seen is of shorter duration.
9. The catatonic symptoms following a generalized electro-shock convulsion have a significantly shorter duration than the same symptoms manifest after either

ES-NF-4 or NF-4 reactions. Therefore, the longer-lasting catatonia of the noise-induced behavior is not entirely attributable to any convulsive exhaustion of the animal, since the catatonic symptoms following a generalized convulsion with maximal electrophysiologic discharge of the nervous system are of significantly shorter duration.

10. The longer duration of a catatonic symptom in rats following noise-induced abnormal behavior as compared to such behavior electrically induced is not attributable to any significantly variable duration of the pre-convulsive running phase of the reaction.

11. The absence of a gross startle reaction and the immediate presence of reflexes in the post-convulsive period of the ES-NF and NF responses contrasted with the complete loss of reflexes and the appearance of uncontrolled startle reactions in the recovery period following generalized electrically-induced convulsions indicates that the ES-NF and NF reactions do not involve complete central nervous system dissolution or a discontinuity of consciousness.

12. The demonstration of rage reactions, squeaking, biting, running away from the situation, reaction to pin-prick, and a general more excitatory response to stimuli in the ES-NF reactions as compared to the NF response indicate that while the motor expression of the two differently evoked reactions may be the same, the NF reaction is characterized not only by neuromuscular dysfunction attributable to the motor expression of the reaction but by behavior which is probably best described as reflecting a generalized inhibitory state of the animal.

(Author's abstr.)

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Level of Autonomic Activity and Electroencephalogram.

In a study of 120 persons in the resting-waking state a correlation of $r = .28 \pm .06$ between parietal-occipital EEG potential and palmar skin conductance and a correlation of $.33 \pm .06$ with heart rate were demonstrated. Combination of skin conductance with heart rate gave a correlation of $.48 \pm .05$, thereby suggesting synergistic autonomic action on the EEG. That these correlations obtained in the resting-waking state are of opposite sign to those typical of excitatory effects after stimulation, suggests that the low level of cortical activity and metabolite production in the resting state permits dominance of the cortex by the subcortically determined $10 \pm$ per sec. rhythm and by vasoconstrictor regulatory effects from the autonomic system. It is pointed out that in certain conditions of anticipation where cortical activity precedes the stimulus and in certain emotional reactions where there may be a suppression of central ideational activity and an exaggeration of subcortical and autonomic effects, such a relationship may explain instances of "facilitation" of alpha and slower EEG potentials. It is suggested that levels of autonomic activity giving correlations with EEG in the resting state opposite in sign to correlations produced in conditions of cortical excitation provide evidence of opposing cortical *v.* subcortical influences on cerebral function and offer a means for studying phenomena of mutual cortical-subcortical regulation.

(Authors' abstr.)

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Disseminated, Diffuse and Transitional Demyelination of the Central Nervous System.

The relationship between disseminated and diffuse sclerosis has been under consideration since Schilder's well-known papers on encephalitis periaxialis diffusa. A table is presented in support of the opinion that a very close relationship exists between disseminated and diffuse demyelination as far as heredity traits, sex, age, duration of disease, clinical diagnosis and gross pathologic findings are concerned.

Cases of diffuse or patchy demyelination of sporadic and heredo-familial type have been reported to occur at all ages from the early age of 1 to 2 months up to the age of 70. The duration of the disease has varied from a few days to 18 to 20 and 26 years and the pathology varied from one of patchy, transitional and diffuse demyelination, irrespective of the original clinical diagnosis.

There are no special mental disturbances which are typical of disseminated sclerosis as opposed to diffuse sclerosis. Bouman thinks that they are not very prominent and Guillain considers them of secondary importance. However, in Gans', Redlich's, Rochon-Duvignaud and the authors' cases they were predominant. Generally, the mental symptoms are more severe in diffuse than in disseminated types. The resulting dementia, if observed, in patchy processes of demyelination is in most cases not so marked as in the diffuse type and the mental symptoms develop sooner in the latter.

Changes of the eyeground (choked disc, optic neuritis, bilateral atrophy or bitemporal atrophy) is relatively more common in the diffuse than in the patchy type. Persistent blindness as opposed to transitory amaurosis, with or without changes of the fundus, is seen very seldom in patchy demyelination, but occurs more frequently in the diffuse type in adults as well as in children. On the other hand, many cases of diffuse sclerosis are reported without alterations of the fundi (Gozzano and Vizioli, Rochon-Duvignaud, the authors' cases). Transitory deafness now and then is found in the diffuse type, more persistent in children. Epileptiform manifestations are more frequent in children, though not uncommon in adults (D'Antona, Bouman, Curschmann). With respect to articulatory speech disturbances, pupillary reactions, abdominal reflexes, Babinski and deep reflexes, paresthesia, nystagmus, disturbances of swallowing, tottering gait, cerebrospinal fluid findings and presence of fever, there is no marked difference between their type and occurrence in either patchy or diffuse demyelination. The tremor of hands, head and trunk occurring frequently in disseminated sclerosis is only occasionally found in the diffuse (Shelden *et al.*). The paresis of the abducens is often mentioned in the diffuse type but its typical alternate appearance and disappearance is exceptionally seen (Austregesilo *et al.*). Facial paralysis was found at times in both disseminated and diffuse demyelination but usually of central type (Bouman, Wilson).

Remissions, which are rare and often of a very short duration in diffuse demyelination (Austregesilo *et al.*, Shelden *et al.*), but longer in Ottonello's cases are more frequently observed in disseminated cases.

Taking into consideration the many clinical analogies between diffuse and disseminated types apart from the cases where a so-called combination was present (Gans, Kufs, Benoit, etc.), it is easy to understand why the diagnosis of disseminated sclerosis is often made in cases of diffuse sclerosis. Schilder himself has asked whether diffuse sclerosis is not a form of acute disseminated sclerosis, especially incident in childhood. Marburg, too, accepts the opinion that a great many of the cases of diffuse sclerosis are really instances of disseminated sclerosis. Bouman, however, thinks that from a "practical point of view it is preferable to separate the two forms though they are very similar."

Histopathologically the fundamental and most striking structural changes in multiple and diffuse sclerosis is the demyelination accompanied or not by involvement of the axis cylinders and followed by a more or less marked gliosis.

The histopathologic picture appears variable mostly in relation to the distribution, extension, intensity and duration of the process responsible for myelinolysis.

From a morphologico-topographic point of view the demyelinated areas may be differentiated in (a) multiple or patchy demyelinations, variable in form and size. The areas may occasionally be large, scattered here and there in white matter. At times interspersed among the larger ones are isolated smaller patches. At times neighboring small areas coalesce, forming larger ones which gradually may involve very large areas of the white matter, assuming the aspect of so-called "transitional type." (b) Diffuse demyelination which may involve the whole subcortical white matter leaving generally intact the "U" fibers. In this group are included Schilder's encephalitis periaxialis diffusa (sporadic and familial cases), encephaloleukopathia scleroticans progressiva, degenerative subcortical encephalopathy, symmetrical cerebral centro-lobar sclerosis, etc. (c) Diffuse demyelination, interspersed by islands of more or less preserved myelin sheaths generally surrounding blood vessels (Pelizaeus-Merzbacher variety). (d) Concentric demyelination formed by bands of more or less normal myelin alternating with demyelinated stripes. This type of "concentric demyelination" (Balo) or "map-like demyelination" (Marburg) is a rare incidence found by the authors and by other authors in cases of disseminated or transitional type in both acute and chronic cases.

After Schilder's detailed description of "encephalitis periaxialis diffusa," many authors accepted his original description of the main histopathologic characters of diffuse sclerosis, namely: (1) large extension of demyelination; (2) limitation of the pathological process only to the white matter of the cerebral hemispheres, with integrity of the cortex and "U" fibers; (3) relative integrity of the axis cylinders; (4) presence of large glia cells and increase of the fibrillary type of neuroglia;

(5) infiltration of the vascular walls with compound granular corpuscles and lymphocytes.

However, in the multiple or patchy and transitional type of demyelination, similar fundamental histologic changes are encountered. Although some authors have attempted to establish differences between disseminated and diffuse sclerosis on the basis of histopathologic features, it seems to us that such a differentiation does not hold true in the light of comparative studies. The review of some of the most important histopathologic features described as typical of diffuse sclerosis will establish their similarities and identities with the histopathologic features of disseminated sclerosis.

1. *Extension and Distribution of the Demyelinated Areas.*—As mentioned above, the histopathologic diagnosis of Schilder's disease is based on the fact that demyelination is intense, diffuse, and is limited to the subcortical white matter. But many cases of diffuse sclerosis have been reported in which, in addition to diffuse demyelination, presence of disseminated isolated patches identical with those of multiple sclerosis were present (Bouman, Gagel, Kufs, Wertham, Schaltenbrand, etc.). The isolated patches were distributed not only in the subcortical white matter but also in the brain stem (Bouman), optic nerves, internal capsule (Gagel), brain stem and spinal cord (Wertham), cortex, brain stem and spinal cord (Gozzano and Vizioli), internal capsule and cerebellum. The presence of these small isolated and disseminated patches of demyelination has been considered by Wertham, Kufs and by the authors as indicative of the mixed or transitional type of demyelination. Such an occurrence has been illustrated by the authors in which the fusion of small isolated patches resulted in large demyelinated areas with a tendency to assume the aspect of a diffuse demyelination. It is presumed that these "transitional forms" complete a passing stage in the development of a diffuse sclerosis.

2. *Involvement of the Ventricular Walls.*—Hallervorden suggested "the integrity of the ventricular walls in diffuse sclerosis" as a differential character between diffuse and multiple sclerosis. However, marked involvement of this region in diffuse sclerosis has been reported by various authors (Stewart *et al.*, Ferraro, Davison and Schick, D'Antona, etc.), and in the authors' case.

3. *Diffusion of the Demyelinating Processes.*—It was felt that generally the areas of demyelination in Schilder's disease have the tendency to diffuse by expansion, whereas large patches in disseminated sclerosis are constituted by coalescence of smaller ones. But in Schilder's disease D'Antona reported the presence of at least three originally isolated foci which fused into a large one involving both cerebral hemispheres. In other cases of diffuse sclerosis, the appearance of large bizarre and irregular patches seems to point to the same mechanism. In Gozzano and Vizioli's case it was noticed that foci of limited dimensions were reunited with the larger central areas through a narrow bridge of demyelination. The authors had also the impression that the peripheral foci were not the expression of a diffusion of the central areas but represented foci in the process of coalescing with the main one.

Another important character in Schilder's disease (Siemerling and Creutzfeld, Walter, Foix and Marie, Scholz, etc.) is the tendency of the demyelinating process to expand along nervous pathways, such as the internal and external capsule. On the other hand, the inferior longitudinal bundle is considered almost constantly preserved. But again this "feature" is really not characteristic because in the case of Gozzano and Vizioli the internal capsule was intact. In case 4 it was only slightly involved, whereas both inferior longitudinal bundles were affected, though in lesser degree than the surrounding areas.

4. *Involvement of the Axis Cylinders.*—Schilder reported in his cases of encephalitis periaxialis diffusa that the axis cylinders were more severely damaged than in cases of multiple sclerosis. Other authors (Gozzano and Vizioli, Cardona, Scholz, Gagel, etc.) have the impression that the involvement of the axis cylinders is in relation to the extension of the process of demyelination, i.e., where the demyelination involves the fibers for a short course the axis cylinders are less involved and better resisting, in contrast with more severe damage when they are deprived of myelin sheaths for a longer course. In the authors' cases the findings were similar to those reported by Weiman, Bielschowsky and Henneberg, Ferraro and Jervis, etc.), namely, partial integrity of the axis cylinders in the initial phase

of the demyelination followed by more or less pronounced destruction in proportion to the myelinolytic process. Sometimes at the periphery of the patch the axis cylinders are much better preserved than the myelin sheaths, while in the center they disclose marked swelling, fragmentation, a granular appearance or "boules terminales" (Weiman). At times they completely disappear. Now and then, however, the axis cylinders appear undoubtedly comparatively better preserved than the myelin sheaths. The authors felt that the severity of the alteration of the axis cylinders is in relation to the intensity and duration of the myelinolytic process.

5. *Demarcation of the Demyelination.*—It is generally considered that in the diffuse type of sclerosis the demarcation of the demyelination is smoother and less distinct than in the patchy type where it appears neat and sharp. Here again many cases of diffuse sclerosis have been reported with neat and sharp demarcation and in the authors' cases of multiple sclerosis the demarcation was hazy and indistinct.

6. *Glia Reaction.*—For some authors the gliosis is considered to be more intense in multiple sclerosis than in diffuse. But it has been noted over and over again that this is not always the case. In the authors' cases they encountered also very intense gliosis in the diffuse type. Although generally there is no appreciable and definite differences between the gliosis of disseminated and diffuse types, distinction must be made between the central parts of the patch and its periphery and the age of the plaques. Generally, the central portion of the diseased areas is occupied mostly by proliferating glia fibrils. The most recent areas or the peripheral zone of the more or less active areas contain numerous astrocytes but not dense fibrils, whereas the older areas are poor in nuclei and contain compact bands of more delicate fibrils.

As far as the presence of "globoid cells" is concerned, the authors mention only that these elements which are considered to be a characteristic of diffuse demyelination (Collier and Greenfield, Coenen and Mir, Barre *et al.*, Cardona, etc.) were noticed also in acute disseminated encephalomyelitis (Ferraro and Jervis, Gill and Richter) and multiple sclerosis (Marburg, Austregesilo *et al.*, etc.). Collier and Greenfield reported that these "globoid" elements were encountered particularly where there was active myelin destruction or where the demyelination appeared to be of more recent date. Austregesilo and co-workers believed that they are identical to the "gemastete Gliazellen" of Nissl and "giant gliocytes." Barre *et al.* insisted upon the straight analogy of these giant glia cells with Alzheimer's cells described in the pseudosclerosis of Westphal-Strumpel and with those encountered in tuberous sclerosis of Bourneville and Brissaud. In the authors' cases of diffuse demyelination as in the cases of Coenen and Mir and of Collier and Greenfield, the authors found astrocytes and "globoid cells" intermingled with compound granular corpuscles and interfascicular oligodendrogliaocytes which in certain instances appeared also swollen.

The question of the role of the glia elements in the pathogenesis of the demyelinating processes and whether an abiotrophic deficiency (Collier and Greenfield, Greenfield, Levaditi, Bielschowsky, Jervis) or a metabolic disfunction or insufficiency (Scholz, Coenen and Mir) of the oligodendroglia cells (particularly) is responsible for the development of diffuse demyelination is still open for discussion.

7. *Blood Vessel Changes and Perivascular Infiltrations.*—In one of the authors' cases of multiple and transitional demyelination the blood vessels were apparently increased in number and size as in a case of diffuse demyelination reported by Bouman. In all of the authors' cases of multiple, transitional and diffuse demyelination, the adventitial sheath of the blood vessels was variably infiltrated by lymphocytes, plasma cells, a few "mast" cells and scavenger cells which were scarce in some places and more abundant in others. In addition, in the sheaths of the blood vessels oval nuclei similar to swollen endothelial nuclei were found. Similar findings were reported also by many other authors in both multiple and diffuse demyelination (Dawson, Marburg, Schilder, Jakob, Siemerling and Creutzfeld, Ferraro).

Now and then the character of the perivascular elements varied; at times predominance of compound granular corpuscles or lymphocytes was found, at others these infiltrative cells were mixed with other kinds of cells as mentioned above. This occurred in both patchy and diffuse demyelination.

Without entering into detail the authors will mention only that in some cases of multiple or diffuse demyelination the perivascular infiltrations were considered as expression of inflammation (Schilder, Bouman, Rhodes, Jacob, Stauffenberg, Gozzano-Vizioli, etc.), of degeneration (Haberfeld and Spieler, Krabbe, Scholz, Globus, Bielschowsky and Henneberg, Hassin, etc.) or of symptomatic inflammation (Spielmeyer and Ferraro). In certain cases it was, however, impossible to give a decisive opinion (Weil), and Spielmeyer himself was often in doubt as to whether the exudative infiltration was related to the reaction of "breakdown" products or expression of independent inflammation.

It is very curious that in some instances the opinions of different authors concerning the same cases were completely at variance. For instance, the case of Stauffenberg was regarded by Weimann as of a degenerative nature, whereas Steiner considered it as an inflammatory one. Weimann referred Bouman's first case of diffuse demyelination to the degenerative group, while Bouman himself considered it as belonging to the inflammatory one.

To date there has been no complete agreement among the neuropathologists concerning the concept of inflammation, degeneration or symptomatic inflammation of the nervous tissue. Ferraro has suggested the term of "hyperergic inflammation" of allergic nature to reconcile the two extreme viewpoints. Also, Marburg, by introducing the new term of "Parencephalomyelitis" intended to indicate that in this condition there is an "accompanying but not a genuine inflammation" of the nervous system. He believed that this reaction might be similar to that elicited by Schwartzmann's phenomenon with sterile toxins.

8. *Relationship of the Demyelinating Areas with Vascular Pattern and their Histogenesis.*—The patches of demyelination in multiple or patchy sclerosis have been considered to be vascular in distribution, whereas in the diffuse type the demyelination is supposed to be independent of the vascular pattern.

But this statement is not supported by many histopathologic reports. Kufs in his first case of diffuse sclerosis observed that one small thalamic focus was in relation to a vein. Similarly in one of Bouman's cases, in Stewart *et al.* and in Perdrau's monkey, isolated patches were in relation to blood vessels. On the other hand, while this perivascular distribution, in the diffuse type has been observed mostly in relation to isolated foci, many disseminated patches of multiple sclerosis have been reported as independent of vascular pattern.

This latter problem has been much discussed since the time of Rindfleisch and Ribert who claimed that the demyelinated areas were related to a primary vascular lesion or thrombosis. But Dawson, Symonds and Wilson, although recognizing a frequent relationship between the lesions and small blood vessels, expressed the belief that the changes were secondary to inflammation produced either by the noxious agent or by the breakdown of the damaged tissue.

Recently, Putnam and co-workers found that demyelination, with or without destruction of the axons, followed experimental obstruction of the small vessels and especially venules. Also, in multiple sclerosis and disseminated encephalomyelitis Putnam, Putnam and Alexander and Scheinker emphasized the occurrence of thrombi in the smaller veins and considered them the primary cause of demyelination. In support of this hypothesis, Simon and Solomon and Dattner found in disseminated sclerosis increased coagulation of the blood.

Marburg considered phlebothrombosis as only one of the etiologic factors of the demyelination in disseminated sclerosis. Hassin instead maintained that "blood vessels play no role in the genesis of the changes in multiple sclerosis, in which the nerve fibers are attacked primarily and directly, without the intermediation of the blood vessels."

In 1942, Dow and Berglund studied the vascular pattern of lesions of multiple sclerosis in serial sections. "Although the lesions were not always oriented about the veins, they found that two-thirds of them were." These authors were inclined to attribute the thrombosis to a "local absorption of thromboplastic substances revealed by the breakdown of myelin." Ferraro, in his attempt at considering the pathology of demyelinating diseases (both patchy and diffuse) as expression of allergic reaction, is in agreement with Abel and Schenck's as well as Putnam's views that the thrombi might be one aspect of allergy. In the authors' cases they found that a large number of demyelinated areas were in relation to blood vessels (arteries or veins) but only occasionally did they observe presence of thrombi.

Many authors have also failed to detect thrombi in cases of disseminated sclerosis. This failure Putnam believed to be due to technical difficulty in demonstrating certain thrombi and to their rapid disappearance from the lesions. It seems necessary to mention that while the writers who disagree with Putnam's views speak in general terms of "blood vessels or arteries," the latter insists more specifically on the involvement of the "venous drainage."

More recently, Hurst and Ternent Cooke studied "capillary fat embolism in the brains of sheep, pigs and monkeys with special reference to demyelination." In their experiments "the lesions ranged from slight demyelination to full necrosis." In addition, they observed that "obstructive plugs (not thrombi) present in the early stage of the reaction, disappeared within a few days from lesions to the formation of which they have obviously contributed."

However, the theory of venous obstruction would still have to explain: (1) why the white matter is almost exclusively involved in many cases; (2) the mechanism of formation of Baló's concentric type of demyelination or of Marburg's map-like ("Landkartenherde") formations, and (3) the occasional preserved perivascular myelin islands encountered in the Pelizaeus-Merzbacher type of demyelination.

9. *Cortical, Extracortical and Spinal Cord Lesions.*—In the diffuse type of demyelination many authors reported that the pathologic process was limited only to the white subcortical areas, whereas the involvement of "extracortical" areas or of the spinal cord was considered secondary and of degenerative character. For this reason they called it also progressive degenerative subcortical encephalopathy, encephalopathia subcorticalis diffusa, etc.

In this connection the authors will mention only that involvement of the gray matter in both diffuse and patchy demyelination was observed in the cases of Gagel, Coenen and Mir, Klarfeld, Weimann, Bouman, Neuburger, Walter, Bielschowsky and Maas, Schelden *et al.*, Kraus and Weil, Wertham, etc., and in the authors' cases.

In addition, several cases of diffuse demyelination were reported in which the demyelinating process also involved the spinal cord. The lesions were not exclusively of a secondary degenerative character but were identical with primary patches of demyelination (Stewart *et al.*, Popi, Jacob, Wertham, Gozzano and Vizioli).

The supracortical pia-arachnoid has generally been reported as normal, but quite often various changes were noticed also in both patchy and diffuse demyelination. Such changes consisted generally of simple thickening of the meninges, lymphocytic infiltration or association of both (Austregesilo *et al.*, Neuburger, Kaltenbach, Bouman, Schilder, Braun, Schaltenbrand), presence of fat granular cells or of fat droplets with slight edema of the meninges (Kraus and Weil) and patches of dense infiltration by macrophages as well as by lymphocytes and polyblasts. In the authors' case the pia-arachnoid in many regions was intact, but over the forebrain there were patches of more or less perivascular and free infiltration of lymphocytes, macrophages, a few plasma cells and some polyblasts.

10. *Products of Degenerative or Disintegrative Metamorphosis*, such as different types of fat-staining material, or prelipoids or "Markballen" (Greenfield and King), mucinophile, argentophile and siderophile products, corpora amylacea ("protagonoide Abbaukugeln" Kaltenbach) and metachromatic substances were found by the authors in both disseminated and diffuse demyelination as well as in the transitional type. Their distribution and histochemical character is generally identical in both types of demyelination. In the authors' estimation, they cannot be used as "typical" differential elements for one or another type of demyelination as Cardona does concerning the intensity of the "metachromatic substance" which he considered to be specific for "Schilder's disease."

11. *Cystic Formations.*—They were described in both patchy and diffuse demyelinating processes (Schilder's first case, Rossolimo, Bouman's case 1, Bodechtel and Guttman, Braun, Borst, etc.). Sometimes these were surrounded by several layers of cylindrical cells giving the impression of small gliomas (Barre *et al.*). A cystic formation was found in the authors' cases of diffuse sclerosis (case 3).

12. *Hemorrhages, Necrosis and Edema.*—Hemorrhages were observed by various authors in cases of diffuse, transitional and patchy demyelination. However, more often congestion of blood vessels is found either in the parenchyma or in the meninges. Perivascular hemorrhages were noticed by Putnam, Zimmerman

and Janet, Davison and Friedfeld in cases of encephalomyelitis which Putnam and Ferraro include in the group of the "acute multiple sclerosis."

Necrotic areas may be present, especially in the very acute cases or in the stages of reacutezation of multiple sclerosis (Marburg, Ferraro). Similar findings were also described in cases of diffuse demyelination (Schilder, Barre *et al.*, Bodechtel and Guttman, Bielschowsky and Hanneberg, Wohlwill, Gerstman and Straussler).

Edema is also found especially in acute cases either free in the parenchyma or in the perivascular spaces (Ferraro, Roizin, Moriarty and Weil, the authors' case).

From these data it is obvious that not only clinically but also anatomically there is a very close relationship between diffuse and disseminated demyelinating processes. It is to be noticed also that the given clinical differential diagnostic points between the diffuse and disseminated types appear to be not of decisive value because they are found in both conditions. Histopathologically close relationship between diffuse and disseminated types must be admitted because disseminated patches and transitional stages are found in some cases of diffuse demyelination and because of the presence in cases of typical disseminated type of demyelination of transitional and diffuse demyelinated areas.

It is not the authors' aim to discuss here in detail the great complication of nomenclature of diffuse and multiple demyelinations which Ferraro attempted to unify and classify some years ago. However, they wish to state that in the absence of more specific and definite data concerning the etiopathogenesis and histogenesis of this insidious disease of the nervous tissue it seems more justifiable, particularly from a histopathologic point of view, to use the term "primary demyelinating diseases" (as Ferraro does) in place of other various arbitrary names, because demyelination is the most striking alteration, and, irrespective of whether it is patchy or diffuse, acute, subacute or chronic in character and sporadic or familial in type, the process is fundamentally the same.

From a descriptive point of view the naming of cases, whether "patchy" or "diffuse," should be based according to the predominance of symptoms or lesions in the case. The term transitional will of necessity have to be used, particularly from the pathologic standpoint, because the clinical symptoms fail at times to furnish precise indication of this occurrence. The term acute, subacute or chronic will be determined mostly by the clinical course. The classification of the familial cases into infantile, juvenile or adult type will be considered as respective varieties of the same clinico-pathologic syndrome and not as individual clinical or pathologic entities. (Authors' abstr.)

AUGUST.

The Treatment of Psychiatric Disorders due to Combat by Means of a Group Program and Insulin in Sub-Shock Doses. *Teitelbaum, T. A., et al.* . 123

*Use of the Bellevue-Wechsler Scale in Clinical Psychiatry. *Goldman, R., and Coon, G. P.* . 144

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Syphilitic Meningitis with Negative Blood and Spinal Fluid. *Kaplan, L. I., and Becker, T. F.* . 200

Use of the Bellevue-Wechsler Scale in Clinical Psychiatry.

Experience with the Bellevue-Wechsler test used over a period of 8 years at the Boston Psychopathic Hospital, leads the authors to believe that it is a superior test because it can be administered with relative ease, it has been standardized on adults over a wide age range, it has the flexibility of a point scale with possibility of direct comparison of performance on various test items; and also because it taps a wide range of functions and elicits data of considerable value and interest to the clinician. In the group of cases characterized by the term "brain damage," this test would seem to be of special value for both diagnosis and investigation.

Both quantitative and qualitative signs are found in patients with "brain damage." The quantitative signs consist essentially in marked discrepancy in the weighted scores between various sub-test items. As a rule, performance on non-verbal items (picture arrangement, picture completion and block designs) is most markedly affected, but there is always at least one verbal sub-test on which there is also loss in ability to function. The qualitative signs are best displayed on the

non-verbal test items where the patients show rigidity, inability to shift attention or change the mode of responding, inability to ignore superficial or extraneous stimuli and difficulty in organizing material into either a required pattern (block designs) or into a meaningful logical sequence (picture arrangement). The same signs do appear in the verbal material but are more difficult to recognize and may often be missed.

Where both quantitative and qualitative irregularity of performance are found, clinical analysis reveals a very high incidence of brain damage.

Within the broader framework of the "organic" pattern as elicited by the Bellevue-Wechsler test, the authors have noted 7 variant configurations or profiles which are more or less mutually exclusive. The full significance of these profiles is not clear as yet; certainly they are not specific for any given disease entity. As a rule, the greater the loss of function as displayed on the psychological examination, the more serious is the brain damage. There are suggestive relationships between the particular psychological configurations and certain groups of symptoms, but it is felt that the meaning of these trends must await further study.

(Authors' abstr.)

SEPTEMBER.

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Paroxysmal Slow Waves in the Electroencephalograms of Patients with Epilepsy and with Subcortical Lesions.

A study has been made of psychomotor waves encountered in 3,000 EEGs over a 2-year period. The characteristics of "psychomotor" activity in 135 epileptics are summarized, and the tendency of psychomotor waves to form shifting foci is stressed. Similar activity has been encountered in addition in 17 proven and 14 probable cases of subcortical pathology. The slower (2-3 per second) psychomotor waves tend to be associated with lesions in the region of the basal ganglia, thalamus and cerebellar hemispheres, whereas 4-6 per second psychomotor waves tend to be associated with lesions in the region of the hypothalamus, pons and (in one case) the cerebellar vermis. It is suggested that psychomotor activity in epileptics probably arises in deep structures. It is emphasized that a focus consisting of or associated with psychomotor activity is usually inconstant and does not indicate focal cortical pathology in the majority of instances.

(Authors' abstr.)

Preliminary Report on the Effect of Glutamic Acid Administration in Mentally Retarded Subjects.

It might be expected that a substance affecting brain metabolism would be more effective in patients whose intellectual potentialities were basically normal, but had been damaged by brain disease or injury, than in patients with a primary mental deficiency. Furthermore, we have found that in functional brain damage, artificially produced by electric shock, glutamic acid administration may exert a favorable influence on confusions, memory and other mental performances. For these reasons we attempted to select for our preliminary study patients with secondary mental deficiency, but in some cases it is very difficult to differentiate between these two types of deficiency and in some of our patients the diagnosis was not certain.

In 7 of the 8 patients studied an unmistakable rise of varying degree in the level of mental function followed the oral administration of glutamic acid in amounts

of 8 to 10 gm. a day. The effect depended on the continuous administration of the amino-acid; when the patients were put on placebos they eventually slumped back to their previous level of performance. This tendency to relapse was not always discernible immediately after discontinuation of the glutamic acid.

On an empirical basis psychometric tests are accepted to-day as giving a good insight into mental capacity even though they do not test the whole performance ability of the patient. To safeguard against errors which are not uncommon in work on mental deficiency, our subjects were repeatedly tested with a battery of different psychometric tests which agreed closely in evaluating the mental capacity. It should be emphasized that most of our patients had been repeatedly tested by different psychologists over a period of years before the present study was undertaken. The IQ was found to be practically static or the gain was very small. The patients received adequate educational attention, and one of them underwent psychotherapy prior to the experiment. With this background the rapid rise in IQ following the administration of glutamic acid can hardly be ascribed to other factors, such as maturation or environmental influences.

It may be argued that the gain in IQ was not valid but resulted from an increased familiarity of the patient with the tests. We believe that this possibility is excluded for the following reasons: (1) The patients were tested several times prior to glutamic acid administration and none of them showed a significant variation in IQ. These pre-treatment tests were spaced at the same time intervals as those carried out later during the glutamic acid periods. (2) Each time the patient was retested, not only the original Binet but other tests with which the patient was not familiar were used. (3) The best proof, however, rests in the fact that the patients dropped in IQ during the placebo period and regained the loss again when glutamic acid was administered.

In analyzing the intellectual gain resulting from the administration of glutamic acid, the question must be asked whether this gain represents an acquisition of new intellectual tools, i.e., an increase of intelligence, or the better utilization of existing intellectual abilities. It was noted that patients who, before administration of glutamic acid, appeared to be dull, inattentive and easily fatigued became more alert, attentive and persistent in trying to accomplish the tasks put before them. It was also observed that in the pre-treatment phase some of these patients appeared at times to be irritable, restless and emotionally labile. During administration of glutamic acid they behaved in a manner which suggested an improved emotional regulation. It seemed to us that the performance of the total personality, rather than of some circumscribed intellectual functions, showed improvement.

In recent investigations on the structure of memory in patients who were exposed to electric shock treatment, similar observations were made by ourselves and Dr. Zubin. Memory impairment and more or less severe confusions after electric shock treatment are known to occur in a large number of patients. 10 to 33 c.c. of a 10 per cent. solution of glutamic acid were administered intravenously to some of these patients at the height of their confusional state, which usually occurs when they have already had 6 to 12 electric shock treatments. The impression was gained that the administration of glutamic acid shortened the period of confusions and memory impairment, and in some patients psychological tests showed an immediate and definite improvement. The memory-defective and confused patients often showed an emotional imbalance such as increased irritability, rapid mood swings, depressed or impulsive behavior, distractibility and inattention. Usually these emotional symptoms improved first and the change in behavior for the better preceded the improvement in the intellectual performance.

It is known to-day that the ability to perform intellectually depends upon many factors, among which the emotional status of the individual plays a significant role. Some patients suffering from organic brain damage show, owing to emotional inhibitory factors, a much more pronounced organic incapacitation than can be explained by the tissue destruction. In hypnosis or under the influence of sodium amytal patients suffering from aphasia, apraxia and many other neurological disturbances may perform much better than otherwise. Memory lapses can also be reduced by these methods. In rehabilitating such patients this factor is now taken into consideration.

From the foregoing considerations it appears possible that glutamic acid does

not so much influence or increase the intellectual ability as such, but only enables the patient to regain his intellectual function which was inhibited by other mechanisms. But inhibitory mechanisms similar to those observed in diaschisis may play a part in addition to the emotional factors. The nervous system often responds to damage with increased inhibitory and excitatory manifestations until a new neural equilibrium is reached. The removal of inhibitory mechanisms in acute cases of brain damage is not surprising, but it is rather impressive that it can occur to some extent in patients with a long-standing brain damage, as in the boy who had an encephalitis 25 years before.

It could be argued that the patients in whom the glutamic acid proved to be beneficial were suffering from traumatic epilepsy. Organic brain damage even without epileptic manifestations sometimes causes intellectual and emotional changes which are similar to those seen in some patients who have epileptic attacks. It could, therefore, be claimed that the improvement with glutamic acid is a result of removing the epileptoid mechanism. There is some evidence that this is not the case. Price, Waelsch and Putnam have pointed out that increase in intellectual efficiency is not always accompanied by a decrease in *petit mal* seizures; and furthermore, our patients did not show a characteristic epileptic pattern in the electroencephalogram.

For practical and for theoretical reasons it is of interest to consider the toxic symptoms observed after the administration of glutamic acid. The oral administration in mentally defective children did not cause any toxic effects. However, in the psychiatric patients, after electric shock treatment, we have occasionally seen gastro-intestinal disturbances, complaints of fullness in the stomach, vomiting and diarrhoea, which, however, subsided rather quickly on reduction of the dose. The intravenous application of glutamic acid caused in some individuals toxic effects of the same type. The individual sensitivity was very variable. Patients with hypersensitivity to the amino-acid complained of flushes, vomiting, feelings of dizziness and of general malaise. These symptoms could be avoided in some cases if the glutamic acid was given in more dilute solution than 10 per cent. and if the injection was given slowly, at a rate of about 1 c.c. per minute. But there remained sporadic cases in whom the toxic reactions occurred even with this technique. These observations on the toxicity of glutamic acid by intravenous injection were made during the last two years, during which time similar observations were reported by others in experiments carried out with animals.

It is impossible at this stage of the investigations to point to any biochemical mechanism as an explanation of the effect in epileptic patients of the administration of glutamic acid, and the same is true for the results obtained with mentally defective subjects. It may well be that other body constituents which may or may not be metabolically related to glutamic acid have the same effect. Up to the present we do not know whether the beneficial results are due to the fact that glutamic acid is administered as free amino-acid and whether they would be also obtained if the amino acid were offered in its linkage in proteins. For these and other reasons it cannot be decided whether we are dealing with a deficiency of glutamic acid which is overcome by its administration. Such a possibility is of major interest from the nutritional point of view since glutamic acid is not only supplied in large amount with the food but is also synthesized in the body.

There are few biochemical studies which may point to a specific role of glutamic acid in brain metabolism. It has been claimed that glutamic acid is the only amino-acid oxidized by brain slices, whereas chopped brain appears to be able to oxidize a variety of amino-acids. A more specific function of glutamic acid in brain metabolism may be deduced from experiments showing that the enzyme system which synthesizes acetylcholine in brain extracts, if inactivated by dialysis, is partially reactivated by the addition of glutamic acid. This finding, if transferable to the intact organism, may offer an explanation of the toxic symptoms, resulting from the intravenous or oral administration of glutamic acid, encountered in psychiatric patients after electroshock.

In this report the authors do not want to raise any extravagant hope that cases of secondary mental deficiency and, by implication, other forms of feeble-mindedness, may be cured with glutamic acid; but there is some indication that a limited influence can be demonstrated on some of these patients. Mental defects have been considered unalterable, and research and treatment have been concentrated

on the social and educational aspects, which are of great importance. Nevertheless, the authors felt that attempts should be made to test the possibility of improving brain function by biochemical means. The results obtained with glutamic acid are considered to be a starting point for further investigations. Long and tedious research will be necessary to solve the question of the specificity of glutamic acid and to test other substances which may benefit some patients and may also elucidate basic neural mechanisms in relation to mental activity. (Authors' abstr.)

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The Influence of Emotion on the Human Electroencephalogram.

1. Hyperemotional states give rise to two characteristic types of electroencephalographic pattern. Type I is characterized by a "spontaneous" low voltage random high frequency pattern. When the attention of the patient is removed from the test and his environment, a normal brain wave pattern ensues. The Type II pattern is characterized by rhythmic, approximately 20 per second activity predominantly in the frontal and parietal regions. This pattern is stable and uninfluenced by afferent stimuli of ordinary intensity.

2. The recognition of these electroencephalographic patterns is important from neuropsychiatric considerations.

3. The rhythmic high frequency potentials observed in hyperaffective disorders is a product primarily of frontal lobe activity.

4. Physiologically increased frontal lobe activity, as evidenced by the superimposition of somatic complaints on a basic emotional disorder, results in an enhanced frontal electric potential output. Hence, the rhythmic high frequency oscillations of the frontal regions may be considered as "true" action potentials. (Author's abstr.)

Porphyria: Neuropsychiatric Aspects in the Case of a Negro.

The diagnosis of porphyria rests on the sum total of signs and symptoms which may be recorded briefly as follows: a hysterical personality with remissions and exacerbations of marked muscular weakness accompanied at times with pronounced but temporary visual impairment and excretion of red-colored urine; an unfavorable response to barbiturates, variability in reflex responses with the recently emphasized absence of knee jerks in the presence of ankle jerks and a summation effect reinstating the normal response of the former; thenar and hypothenar atrophy indicating early anterior horn cell involvement. In addition to these, the other signs and symptoms mentioned in the report add further weight to the diagnosis. Regarding bone changes in porphyria, Nesbitt says: "The bone marrow may appear hyperplastic, and occasional large cells laden with brown pigment may be seen."

An especially interesting fact in this patient is the sequential relationship of the anxiety episodes to the onset of the physical manifestations of the illness. (Author's abstr.)

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The Relation Between the Electroencephalogram and Muscle Action Potentials in Certain Convulsive States.

1. The EEG's of 2 subjects with severe myoclonic seizures and 1 subject with mild myoclonic jerks accompanying wave and spike discharge in the EEG are described.

2. Repeated simultaneous recordings of the EEGs and muscle action potentials have been made in these subjects during myoclonic episodes.

3. All subjects show some form of spike discharge, with or without a slow wave, in the inter-seizure periods. In the seizures the patients with the severe myoclonic jerks show discharges of spikes in their EEGs with a period of 30 to 75 msec. at a rate of 8 to 13 per second.

4. There is an accurate correlation between the occurrence of the spike-like discharges in the EEG and the action potentials of the muscular jerks in the severe cases and a less accurate correspondence in the mild case.

5. The muscle action potentials show recruitment and facilitation having a different time course of decay for flexor and extensor muscles.

6. In the periods between the spontaneous jerks changes in spinal reflex excitability may be demonstrated.

7. Important differences in the characters of the muscular jerks in the severe myoclonic states and the milder state accompanying wave and spike discharge are described.

8. These findings are discussed and their bearing on the origin and mediation of the abnormal discharges in these conditions are considered.

(Author's abstr.)

The Disorganization of Behaviour in Fatigue.

The skilled activity required by an exercise in instrument flying was observed to become disorganized in an experimental situation which was assumed to be fatiguing. The disorganization had two phases, in each of which it was associated with characteristic changes of feeling. The two phases of the disorganization, with the associated effects, were considered to constitute two distinct reactions to the test conditions.

In the first phase, all parts of the work were similarly affected. Although there was little or no increase in their duration, errors became more frequent and were overcorrected. Activity became excessive; movements of the controls tended to be too extensive, and there was a large increase in restless and inappropriate movements. Attention was distributed irregularly over the work and was held by aspects which had acquired a temporary urgency.

Subjects felt under strain, dissatisfied and irritable, and they were preoccupied with the test after it was finished. Signs of emotion, such as agitation and restlessness, were observed, and there were indications that muscular tonus was increased. Flushing of the face was common, and visible sweating also occurred.

In the second phase, some parts of the work were affected more than others, those regarded by the subjects as of greater importance being the better preserved. Errors became less frequent, but their correction was tardy and they were larger. Movements of the controls were often as extensive as in the first phase, but were fewer. Concentration failed and interest flagged. Some subjects were satisfied with a lowered standard of accuracy, whereas others were dissatisfied with their attainment, but made an insufficient response to remedy it, either emotionally or in organized activity, and they were apathetic and discouraged. Postural changes were variable, but flushing, or sweating was rare.

(Author's abstr.)

APRIL.

A Familial Disease Characterized by a Diffuse Angiomatous Non-calcifying Cortico-meningitis and Progressive Demyelination of the White Matter.

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Aetiology and Pathogenesis of Acute Sporadic Disseminated Encephalomyelitis and Multiple Sclerosis.

As a result of our experimental, anatomical and clinical findings we have been able to draw the following conclusions:

1. This work is the first in which experimental investigation of acute encephalomyelitis and multiple sclerosis has been successfully carried out and the infectious origin of these diseases experimentally and clinically confirmed.

2. Virus investigation of patients suffering from acute disseminated encephalomyelitis and multiple sclerosis has enabled us to isolate two strains of filterable virus—from the blood of one case, and from the cerebral tissue of another case of acute disseminated encephalomyelitis. These strains have proved to be identical, and differ from other known human neurotropic viruses.

3. The syndrome of acute disseminated encephalomyelitis has been produced in animals by means of inoculation with this virus. The morphological picture obtained has proved identical, particularly in rabbits and puppies, to that found in man suffering from acute disseminated encephalomyelitis. These experiments are the first in which experimental acute encephalomyelitis has resulted from the inoculation of human material.

4. On the basis of the above data an attempt has been made to neutralize the virus thus isolated with the sera of patients suffering from acute disseminated encephalomyelitis and multiple sclerosis. The virus has been neutralized by sera from 50 per cent. of cases of multiple sclerosis and from 70 per cent. of cases of disseminated encephalomyelitis.

5. These positive neutralization tests suggest that both of these diseases result from the same agent. On the other hand, a negative test does not necessarily indicate a different causative agent. Hence, acute disseminated encephalomyelitis and multiple sclerosis have the same aetiology in some of the cases, while in others the same anatomical and clinical syndromes may be elicited by other agents, or possibly by the same agent but with a different antigenic structure.

6. A small number of cases of acute disseminated encephalomyelitis and multiple sclerosis, subjected to specific vaccine therapy, has yielded so far satisfactory results. Clinical improvement has been registered, together with a considerable increase of antibodies in the blood.

7. It is our belief that this work is far from being complete. The results put forward by us may form a basis for further investigation. (Authors' abstr.)

Re-education in Aphasia.

1. The problem of re-education in aphasia is briefly considered and some practical methods of retraining described.

2. The outcome of re-education in a group of 70 dysphasic cases is reviewed and evaluated. Treatment in 14 of these cases was begun 6 months or more after the onset of the disorder, when relatively little further spontaneous improvement was to be expected.

3. The results are considered in relation to the various aspects of language affected (speech, reading, writing and calculation), and to the type, severity and aetiology of the dysphasic condition. Although the number of cases is too small to permit a determination of the statistical significance of the results, it is suggested that the most favourable outcome is obtained in traumatic cases and in those whose symptoms are relatively mild and predominantly on the executive side.

4. Two-thirds of the patients given re-educational treatment were resettled in economic employment. (Authors' abstr.)

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Electromyographic Studies of Muscular Co-ordination on Stimulation of the Motor Cortex.

Experiments were performed on the effect of stimulation of the motor cortex of cats and monkeys on muscular co-ordination by means of electromyograms of flexor and extensor muscles. It was found that the effects depend on duration and intensity of stimulation, as follows:

1. Very weak stimulation of the motor cortex causes relaxation of flexor and/or extensor muscles if a pre-stimulatory tonic activity is demonstrable in the electromyograms. Such cortically induced inhibition is frequently followed by a post-stimulatory rebound.
2. With slightly increased intensity which calls forth a movement (flexion or extension), reciprocal innervation of agonist and antagonist may be observed, whereas somewhat stronger stimuli cause simultaneous activity in flexor and extensor muscles, i.e., co-innervation, and consequently co-contraction, during flexion or extension.
3. Variations in the duration of the period of stimulation exert effects similar to those seen in experiments involving different intensities. Whereas reciprocal innervation appears during the early phase of stimulation it is later followed by co-innervation while the stimulation continues.
4. Even the agonist may show a transition from inhibition to excitation during stimulation at constant frequency and intensity.
5. It is shown that an inhibitory period frequently occurs on cessation of stimulation.
6. The phenomena described under 1-5 are interpreted as indicating that with increasing number of discharging neurons the peripheral effect on individual muscles changes from inhibition to excitation, and in the case of an antagonistic pair of muscles, from inhibition to reciprocal innervation, and finally to co-innervation. Under conditions permitting facilitation the predominant type of co-ordination of fore and hindleg muscles in flexor and extensor movements of moderate intensity is that of co-innervation.

(Authors' abstr.)

Centrifugal Deterioration of Asphyxiated Peripheral Nerve.

Electrical thresholds of points on a circulated nerve preparation in the cat were determined as the least electrical stimulus required to evoke either a contraction of muscle or the A-wave led from the distal end of the nerve. Then the trachea was clamped and threshold observations were continued.

The most proximal point was always the first to undergo an increase in threshold culminating in complete inexcitability. Successively more distal points underwent similar change with passage of time. Points 6 per cent. and 85 per cent. of the distance between proximal and distal ends of the nerve underwent a five-fold threshold increase in 13 and 96 minutes respectively.

Roots were inexcitable before onset of threshold elevation at the mid-point along the nerve length. In a partly deteriorated nerve, deterioration was further advanced in the central than in the peripheral half of a segment, but of the fibers blocked in the segment, some were blocked only in the peripheral half.

It is thought most likely that in these experiments a given block along a given fiber involved but a very short segment of the fiber, blocking along a greater length resulting from fusion of these short blocked segments. The field of blocking originated at the central end of the nerve and moved peripheralward. Within the field of blocking, blocks appeared most rapidly at the central end, least rapidly at the peripheral end.

This proximo-distal gradient of deterioration must be a manifestation of a gradient along the intact nerve in the living animal. (Authors' abstr.)

The Hypothalamic Regulation of Sleep in Rats: An Experimental Study.

1. In the rat complete bilateral transection of the hypothalamus, irrespective of location, interferes with the normal regulation of sleep.

2. The location of lesions which cause disturbances of the function of waking indicates the existence of a structure in the caudal hypothalamic region and in the adjacent part of the midbrain tegmentum, which is of specific importance for the capacity of maintaining the waking state during the absence of external stimuli ("waking centre").

3. There is reason to accept a structure in the preoptic region, which is of specific importance for the capacity of sleeping ("sleep centre").

4. Evidence is offered that sleep is caused by an inhibitory action of the sleep centre on the waking centre.

5. The lateral hypothalamic area seems to be of more importance for the regulation of sleep and waking than the inner areas. It seems probable that the medial forebrain bundle, which occupies this area, is implicated in the transmission of impulses determining the sleep-waking rhythm.

6. The hypothalamic centres involved in the regulation of sleep are topographically identical with those determining the autonomic balance.

(Author's abstr.)

Frequency of Centripetal Stimulation in Inhibition and Facilitation of the Knee-jerk.

An analysis has been made of the relations between the frequency of centripetal stimulation of a nerve-trunk and the resulting reflex effects upon the anterior horn cells innervating the quadriceps muscle in the acute spinal cat. These effects can be classified as (i) ipsilateral extensor activity; (ii) ipsilateral inhibition of the knee-jerk; (iii) contralateral extensor activity; (iv) contralateral facilitation of the knee-jerk; (v) inhibitory after-effects, and (vi) excitatory rebound.

The intensity of the excitatory process increases with frequency from 1 per sec. up to 30 per sec., without further increase up to 120 per sec. The rate of increase is slow at frequencies lower than 8 per sec. The intensity of the inhibitory process increases with frequency from 1 per sec. up to at least 120 per sec., the highest frequency studied. (Author's abstr.)

Mechanism of Pupillary Dilatation Elicited by Cortical Stimulation.

Pupillary dilatation elicited by electrical stimulation of area 8 in the cerebral cortex of the monkey is a localized sympathetic response having all the properties of reciprocal innervation. This response is abolished by section of the cervical sympathetic chain, minimal pupillary dilatation due to inhibition of the oculomotor nucleus being obtainable only under special conditions of anesthesia. The active dilator component travels over pathways involving the hypothalamus. This cortico-hypothalamic pathway is not a direct one. The reciprocal inhibitory pathway from area 8 to the oculomotor nucleus has been shown to be a direct projection. (Authors' abstr.)

Inhibition at the Nerve Muscle Junction in Crustacea.

The effect of inhibitory nerve impulses on the potential changes and on the successive contractions of crustacean muscle was investigated.

1. The action potentials of inhibitory axons do not differ from those of other nerve fibres. Inhibitory impulses alone have no detectable electrical effect on the muscle. These findings confirm those of other investigators.

2. There are two separate actions of inhibitory impulses on the motor response:

(a) An electrical effect, the α -action, reduces the junctional potential (e.p.p.) to an extent depending upon the relative times of arrival of inhibitory and motor impulses at the junction. Due to the reduction of the e.p.p. (i) the setting up of propagated muscle impulses is prevented, and (ii) local contractions at the junctional region are diminished or abolished. At 17° C. that α -action lasts about 20 to 25 msec. and declines to half in about 5 msec. The time course of the e.p.p. is not appreciably altered by inhibition.

(b) The inhibitory impulse has direct action on the contractile process at the junction, the β -action. At low frequencies complete mechanical inhibition can be obtained without reduction of the e.p.p. This confirms observations by Marmont and Wiersma (9). The β -effect can sum at intervals of 0.1 sec.

3. Facilitation responsible for the growth of successive e.p.p.s is not affected by inhibition at 50 per sec. The first or second e.p.p., after cessation of inhibitory impulses, reaches the amplitude to which it would have grown in the absence of inhibition.

4. It is suggested that the α -effect is due to action of the inhibitor on the junctional receptors of the muscle membrane, and that the release of the transmitter is unaffected. (Authors' abstr.)

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Observations on Encephalographic Findings in Cerebral Trauma.

1. The encephalographic findings in a series of 261 patients, 206 of whom had had cranial trauma, have been reviewed. Of these, 177 had head injuries with skull defects, while 29 had closed head injuries.

2. Abnormal encephalograms were found in 74 per cent. of the cases of head trauma.
3. Unilateral dilatation of the ventricles was found in 29 per cent. of the cases of head trauma. Symmetrical bilateral dilatation of the ventricles was found in 16 per cent. of these cases; asymmetrical bilateral dilatation in 29 per cent.
4. In a group of 60 cases in which second-day study of the ventricles was made, an increase in the ventricular size on the second day was found in over one-third.
5. Many of the encephalographic abnormalities were found within a short time after injury.
(Authors' abstr.)

Cortical Localization by Electroencephalography. The Value of a Quantitative and Statistical Analysis of Homologous Recordings Obtained Simultaneously.

1. A modified electroencephalographic technique based upon the quantitative and statistical analysis of homologous recordings obtained simultaneously has been investigated for its cortical localizing value. The principle involved is identical with that employed in the neurological examination in which focal abnormal findings on one side are checked against the normal side as a control. The technique methods of analysis and principles of evaluation are presented in detail.
2. This technique has been employed in 1,200 examinations on patients who have received an adequate clinical work-up. Definite cortical localizations were obtained in approximately one-third of this abnormal group, which gave a high degree of correlation with the clinical findings. 90 per cent. of the remainder had convulsive states or other conditions in which focal signs and symptoms or neurological findings of localizing value were not obtained.
3. In 248 patients of this group subjected to pneumoencephalography, an overall correlation of 81 per cent. was observed between the roentgenographic findings and those of the electroencephalogram obtained by means of the technique of homologous recordings.
4. In 85 proved cortical lesions an electroencephalographic correlation of 95 per cent. was obtained.
5. It is estimated that electroencephalographic localization of lesions of a less gross character was made in approximately 20 per cent. of the entire group, which correlated well with the clinical and pneumoencephalographic findings and which would not have been detected by other techniques.
6. The extra time and effort required by the technique are not excessive and appear to be well justified when used for purposes of localization.
(Authors' abstr.)

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Psychotic Casualties in New Guinea, with Special Reference to the Use of Convulsive Therapy in Forward Areas.

1. The problems of accommodation and treatment of psychotic casualties at an Australian general hospital in a forward area are presented.
2. The dangers attendant upon air transport and the methods successfully adopted to combat them are discussed.
3. A description and classification of the types of psychoses encountered in service personnel in New Guinea during the period from June, 1944, to May, 1945, inclusive, reveal that the same forms of illness occurred in service personnel as are met with in civil life. An interesting feature was the extreme degree of excitement and agitation manifested immediately prior to admission to hospital.
4. The role of "Atebrin" in the production of psychotic illnesses is discussed, and the type of illness attributed to such intoxication is described.
5. Certain impressions resulting from the observation of 333 cases have been given. A comparison is made of the results obtained before and after the introduction of convulsive therapy, and the value of this form of treatment in the management of psychotic patients who are violent and resistive and in the overcoming of the necessity for physical restraint is shown. (Author's abstr.)

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Motor Chronaxia in Aged Patients with Generalized Arteriosclerosis.

An analysis of the chronaxia and rheobase values obtained in generalized arteriosclerosis patients varying in age from 57 to 96 enables us to note peculiarities in the excitation of the neuro-muscular system in aged persons as compared with the chronaxia values in healthy people of middle age (men and women).

A comparison of the data obtained with the results of chronaxia and rheobase measurements in persons of the same age who had attained normal physiological senescence, shows that no essential differences exist between the values except those for the rheobase. The rheobase figures in aged persons who have attained physiological senescence is somewhat higher than the rheobase value in middle-aged persons; whereas in diseased persons of advanced age it is twice and sometimes three times as high as the normal.

The most pronounced cases of decreased chronaxia are noted in cases of generalized arteriosclerosis and in emphysema of the lungs, while cases of increased chronaxia are encountered in generalized arteriosclerosis attended by manifestations of cardiovascular deficiency. (Authors' abstr.)

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Pavlov's Doctrine of the Protective and Therapeutic Role of Inhibition in Instances of Trauma of the Nervous System.

It is generally considered that Pavlov thought of inhibition as playing a secondary, protective role in the regeneration of injured nerve centers, preventing further damage from pathogenic stimuli while other factors brought about the regeneration of the tissue. Asratian believes it is closer to Pavlov's doctrine to say that inhibition not only plays a protective role but is also an active, independent, therapeutic factor. Having thus stated Pavlov's point of view, he recounts a series of his own investigations whereby he developed techniques for accelerating recovery from injuries to the nervous system by the use of narcotics.

(Psychol. Abstr.)

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*A Comparison of the Exercise Response in Various Groups of Neurotic Patients, etc.	<i>Jones, M., and Mellersh, V.</i>	192
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A Comparison of the Exercise Response in Anxiety States and Normal Controls.

1. Twenty normal controls, 10 anxiety states (with somatic anxiety symptoms but with no complaint of poor exercise response) and 10 effort syndrome patients are compared regarding their responses to moderate exercise on a bicycle ergometer.
2. O_2 uptake, lactate rise and pulse area were determined after exercise for each group.
3. The anxiety states as well as the effort syndromes had a significantly poor exercise response compared with the normal controls.
4. O_2 consumption after standard work is probably the most satisfactory quantitation of exercise response, but the three tests collectively give the most reliable index.

(Authors' abstr.)

The Effect of Exercise on Soldiers with Neurocirculatory Asthenia.

1. A simple classification for different types of effort syndrome is outlined.
2. Twenty-five Group II ("constitutional") effort syndromes showed a mean blood lactate rise of 28.9 mgm. per cent. ± 6.14 s.d. after standard exercise on a bicycle ergometer. The corresponding figure for 35 normal controls was 21.1 mgm. per cent. ± 5.89 s.d., which is significantly different.
3. Ten Group III (psychogenically produced) effort syndromes did not show a significantly different lactate rise compared with the controls.
4. When worked to exhaustion point on a bicycle ergometer 20 normal controls showed a mean blood lactate rise of 78.0 mgm. per cent. ± 8.15 s.d. Twenty E.S. patients gave a mean blood lactate rise of 50.2 mgm. per cent. ± 5.74 s.d.
5. Pulse rise and decrement after standard work is highest in Group II E.S. and lowest in the normal controls, with Group III E.S. occupying an intermediate position.

(Authors' abstr.)

A Comparison of the Exercise Response in Various Groups of Neurotic Patients, and a Method of Rapid Determination of Oxygen in Expired Air, Using a Catharometer.

1. The exercise response to standard work on a bicycle ergometer of five different groups of neurotic patients (E.S., Group II; E.S., Group III; somatic anxiety states; anxiety states without demonstrable somatic anxiety, and patients with conversion hysteria) is compared with 20 normal controls, regarding oxygen uptake, lactate rise and pulse area.

2. All five groups are significantly worse than the controls when oxygen uptake is compared, but this differentiation is not so complete with the lactate rise and pulse area. The oxygen uptake figures indicate that poor exercise response is an attribute of neurotic patients in general.

3. A catharometer is a simple, quick and accurate method for oxygen estimation, and compared with Haldane's method of gas analysis on 22 gas samples gave a product moment correlation of 0.996. (Authors' abstr.)

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Changes in the Electroencephalogram and in the Excretion of 17-Ketosteroids Accompanying Electro-shock Therapy of Agitated Depression.

1. Thirteen women suffering from agitated depression have been studied before, during and after periods of 8 to 15 electro-shock treatments.

2. Daily ratings with the use of a new psychiatric scale are found to correlate well with fast (> 13 per second) frequencies in the electroencephalograms. When the patients improve, the percentage of time these waves are present decreases; when they relapse the fast waves tend to return. However, there is also a tendency for the fast waves to return in some patients showing good remission.

3. The diurnal rhythm of the nightly rate of 17-ketosteroid excretion divided into the morning rate as a measure of adrenal cortical activity was also measured. While this value for normals is 1.60, in the patients studied the mean pre-treatment value was 1.03; during the treatment period it rose to 1.32, and declined in the post-treatment period to 1.25.

4. The possible significance of these findings is discussed in terms of questions they raise for future exploration. (Authors' abstr.)

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1. Biochemistry, Physiology, Pathology, &c.

Particularly Intense Acetylcholine-like Activity of a New Series of Polyalcohol Amino Acetals. Fournreau, E., Bovet, D., Bovet, F., and Montezin, G. (Inst. Pasteur, Paris). [Bull. soc. chim. biol., **26**, 516-27 (1944).]

All of the compounds mentioned below have a parasympathomimetic and muscarinic action in experimental animals. F 2249 and F 2301 also have a nicotinic action (produce hypertension in the atropinized dog); the others do not (2,3-dihydroxypropyl) trimethylammonium iodide formal (F 2249), $\text{O} \cdot \text{CH}_2 \cdot \text{O} \cdot \text{CH}_2 \cdot \text{CHCH}_2 \text{NMe}_3\text{I}$, is 0.5-2.0 times as active as acetylcholine (1). The acetal, $\text{O} \cdot \text{CHMe} \cdot \text{O} \cdot \text{CH}_2 \cdot \text{CHCH}_2 \text{NMe}_3\text{I}$ (F 2268), is 10-50 times as active as (1) and is possibly the most potent poison of this type known. The propionaldehyde derivative (F 2292), $\text{O} \cdot \text{CHEt} \cdot \text{O} \cdot \text{CH}_2 \cdot \text{CHCH}_2 \text{NMe}_3\text{I}$, and the acetone derivative (F 2269), $\text{O} \cdot \text{CMe}_2 \cdot \text{O} \cdot \text{CH}_2 \cdot \text{CHCH}_2 \text{NMe}_3\text{I}$, are 0.1 as active as (1), and the benzaldehyde derivative (F 2262), $\text{O} \cdot \text{CHPh} \cdot \text{O} \cdot \text{CH}_2 \cdot \text{CHCH}_2 \text{NMe}_3\text{I}$, is about 0.001 as active as (1). $\text{O} \cdot \text{CHMe} \cdot \text{O} \cdot \text{CH}_2 \cdot \text{CHCH}_2 \cdot \text{CH}_2 \cdot \text{CH}_2 \text{NMe}_3\text{I}$ (F 2301), and the corresponding triethylammonium derivative (F 2302), have a very weak action, and so do $\text{O} \cdot \text{CHMe} \cdot \text{O} \cdot \text{CH}_2 \cdot \text{CHCH}_2 \text{NMe}_3\text{I}$ (F 2276), and $\text{O} \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \text{O} \cdot \text{CHCH}_2 \text{NMe}_3\text{I}$ (F 2291).
L. E. GILSON (Chem. Abstr.).

Biochemistry of Choline and its Derivatives. XII. Determination of Total Choline and Water-insoluble Choline of Tissues. Kahane, Ernest, Levy, Jeanne, and Libert, Odette (Univ. Paris). [Bull. soc. chim. biol., **27**, 65-72 (1945); cf. C. A., **40**, 1548².]

A 1 gm. sample of blood, milk, urine, or fresh animal or plant tissue is mixed with 0.5 c.c. of concentrated H_2SO_4 in a porcelain crucible and left for 24 hours in an oven heated to 100-110°. At this temperature, in contact with air containing a little moisture, the H_2SO_4 becomes concentrated to approximately 65 per cent. by weight and remains at this concentration. Much organic matter is destroyed. Free and combined choline is converted to the salt of the half ester, $(\text{CH}_3)_3\text{NCH}_2\text{CH}_2\text{SO}_4$. No decomposition of choline occurs under these conditions although conversion to $(\text{CH}_3)_3\text{N}$ may occur at higher temperatures. The contents of the crucible are washed into a flask with about 25 c.c. of water (the resulting mixture should contain approximately 4 per cent. by weight of H_2SO_4) and refluxed 8 hours to hydrolyze the ester. Then 1 c.c. of 50 per cent. FeCl_3 solution and an excess of CaCO_3 are added, the mixture is filtered, and choline is determined in the filtrate by known methods. It is sometimes necessary to treat the precipitate on the filter paper with dilute HCl to dissolve the $\text{Fe}(\text{OH})_3$ and excess CaCO_3 and treat the insoluble residue of organic matter (containing CaSO_4) with H_2SO_4 , etc., as before, to render soluble some choline not made soluble during the first treatment.

L. E. GILSON (Chem. Abstr.).

Changes in the Contents of Acetylcholine in Nervous Tissue Under the Influence of Constant Current. Babitskii, Eug. B. (State Pedagogical Inst., Moscow). [Nature, **157**, 730 (1946).]

Non-polarizable electrodes were applied to dog brain and a d.c. of 4-10 ma. was used for 10 minutes, after which pieces of the brain were removed and analyzed. Nerve fibers of dog and cat were similarly treated. In all cases the tissue immediately adjacent to the cathode showed an increase in acetylcholine and that next to the anode a decrease.

L. E. GILSON (Chem. Abstr.).

Mechanism of Apnea Provoked by Acetylcholine. Martini, V., and Calcagno, L. (Univ. Geneva). [Boll. soc. ital. biol. sper., **15**, 587-8 (1940).]

The production of apnea in experimental animals by acetylcholine is not due to action through the central nervous system, but appears to be a direct effect on the lungs, probably on the bronchial musculature.

L. E. GILSON (Chem. Abstr.).

Action of Acetylcholine and of Vitamin B₁ by the Suboccipital Route on Blood Sugar and Calcium. Gomez, F. Idoipe, and Ortiz, A. Valcarveres. [*Farmacoterap. actual* (Madrid), **2**, 169-76 (1945).]

Acetylcolhine, 100 mgm. per kgm., injected into the cisterna magna of dogs produces a large rise of blood sugar. This does not occur after previous adrenalectomy. Blood Ca falls probably owing to the resulting overbreathing. Vitamin B₁ (25 mgm.) has a similar action on the blood sugar but does not alter the Ca level.

B. A. (Chem. Abstr.).

Experiments on the Mechanism of Action of Acetylcholine. Effects of Potency and Concentration, and their Recognition in the Isolated Intestine of the Rabbit. Beccari, E. [*Arch. sci. biol. (Italy)*, **29**, 191-224 (1943).]

The diastolic tonus of decontraction of the tonus in the isolated surviving intestine of the rabbit indicates a duality in the mode of action of acetylcholine upon that organ. The pharmacological action is related to the quantity of the drug fixed upon the effectors which may be termed the "concentration effect," and on the speed of this fixation, which may be called the "potential effect." Experiments reveal that the "potential" effect does not follow the strictly physicochemical laws which apply to non-living membranes.

D. I. MACHT (Chem. Abstr.).

Studies on Choline Acetylase. II. Formation of Acetylcholine in the Nerve Axon. Nachmansohn, David, John, Hedda M., and Berman, M. (Columbia Univ.). [*J. Biol. Chem.*, **163**, 475-80 (1946); cf. *C. A.*, **39**, 2519^g.]

A relatively high concentration of choline-acetylating enzyme system (I) was observed in the peripheral axon (II) of rabbit, which is free of cell bodies and nerve endings. The presence of this (I) in (II) supports the assumption that acetylcholine (III) is not only essential for the transmission of the nerve impulse across the synapse but also for its propagation along the axon. In degenerating nerve fiber the enzyme activity decreases slowly, and 72 hours after section, when the condition disappeared, the enzyme activity decreased two-thirds. Six days after section no enzyme activity remained. These results support the assumption that the formation of (III) is associated with condition.

L. WEIL (Chem. Abstr.).

Microscopic Lesions in Acetylcholine Shock. Altschul, R., and Laskin, M. M. (Univ. Saskatchewan, Saskatoon, Saskatchewan, Canada). [*Arch. Path.*, **41**, 11-16 (1946).]

Sublethal and lethal doses of acetylcholine caused vascular reactions in rats and guinea-pigs comparable to other types of shock. About half the animals showed pulmonary edema.

M. L. C. BERNHEIM (Chem. Abstr.).

Stimulation of Phosphorylation in Muscle by Acetylcholine. Wajzer, J. [*Compt. rend. soc. biol.*, **139**, 375-6 (1945).]

In frog muscle poisoned with iodoacetate, acetylcholine 1 : 10,000, accelerates the transfer of H₃PO₄ from creatine phosphate to hexose with formation of hexose diphosphate. The adenosine triphosphate remains unchanged. In this respect acetylcholine acts like ionic K.

L. E. GILSON (Chem. Abstr.).

Chemical and Electrical Origin of Nervous Energy. Barnes, T. Cunliffe. (Hahnemann Med. Coll., Philadelphia). [*Hahnemannian Monthly*, **81**, 56-60 (1946).]

A discussion of the acetylcholine theory of the action current in nerve.

JOSEPH S. HEPBURN (Chem. Abstr.).

Vagus Substances. v. Muralt, Alexander (Bern). [*Experientia*, **1**, 136-46 (1945) (in German).]

A lecture discussing the liberation of acetylcholine and thiamine on nerve stimulation and the physiological interrelationships between the two substances.

J. M. LITTLE (Chem. Abstr.).

Acetylcholine Synthesis. Torda, Clara, and Wolff, Harold G. (Cornell Univ. Med. Coll., Ithaca, N.Y.). [*Science*, **103**, 645-6 (1946); cf. *C. A.*, **39**, 550³, 983³, 1208⁷, 1927³, 4101⁵; **40**, 2211⁷.]

Chiefly review with 33 references.

It is postulated that normally occurring constituents of cells and extracellular fluid modify the amount of acetylcholine synthesized in the living organism. There is a dynamic equilibrium between potentiator substances and inhibitor substances. During physiological activity the original dynamic equilibrium is disturbed and new dynamic equilibrium is established. Certain metabolites of muscle released during prolonged work decrease the synthesis of acetylcholine. The accumulation of such metabolites is important in the production of fatigue resulting from indirect stimulation and secondary to decreased acetylcholine synthesis.

E. D. WALTER (Chem. Abstr.).

Effect of Acetylcholine and Adenosine Triphosphate on Denervated Muscle. Buchtha, Fritz, and Kahlson, Georg (Univ., Lund, Sweden). [*Acta Physiol. Scand.*, **11**, 284-8 (1946).]

Na adenosine triphosphate initiates contractions in denervated anterior tibial muscles of the cat which last longer than in normal muscles. But whereas normal muscle is not affected by a previous injection of acetylcholine, this abolishes the sensitivity of denervated muscle to the ATP. Denervated muscle is 40-50 times as sensitive as normal muscle to acetylcholine whose curare-like action also is very pronounced in denervated muscle. It is argued that the motor end plate survives even a high degree of muscle atrophy, such as exists after 75-85 days of nerve degeneration because in this condition the muscle still shows increased sensitivity to acetylcholine which can be abolished by curarization.

S. MORGULIS (Chem. Abstr.).

Properties and Distribution of the Enzyme System which Synthesizes Acetylcholine in Nervous Tissue. Feldberg, W., and Mann, T. (Cambridge Univ., Eng.). [*J. Physiol.*, **104**, 411-25 (1946); cf. *C. A.*, **29**, 4667⁹; **40**, 1923⁸.]

The enzyme was obtained by extraction of acetone-dried tissue with 0.9 per cent. NaCl. Its activity was greatly increased by adenosine triphosphate (ATP), citric acid, and a third substance referred to as the activator and which was found in the juice prepared by extraction of the brain tissue with boiling saline solution. The activator was dialyzable, was not mineral nor identical with choline, ATP, glutathione, cozymase, or thiamine. It was present in liver in approximately the same concentration as in brain, and small amounts were in muscle and yeast. The activating effect of citric acid was not due to its Ca-binding capacity, and the effect was not abolished by malonic acid. None of dl-glutamic, l(+)-glutamic, aconitic, succinic, fumaric, acetic, oxalic, tartaric, pyro-phosphoric, malonic, pyruvic, or oxaloacetic acids showed an accelerating effect comparable to that with citric acid. If ATP, citrate, and the activator were added together to the saline extract from acetone-dried brain, as much as 1.8 mgm. acetylcholine/gm. powder/hour at 37° was formed, or 6 mgm./gm. dry weight of extract. The dialyzed extract was inactive and was not reactivated by any one of the three activators alone, but was by citrate and activator, and in particular by citrate, activator, and ATP. The concentration of enzyme in the nervous tissue varied widely between species, and between parts of the nervous system of a given species. The activity was greater in cerebrum than cerebellum, greater in efferent cholinergic fibers than in afferent fibers. For a given rate of synthesis the corresponding content of acetylcholine was higher in the peripheral than in the central nervous system.

H. L. WILLIAMS (Chem. Abstr.).

A New Method of Estimation of Acetylcholine with the Isolated Duodenum of the Rat. Bayo Bayo, J., García de Jalón, M., and García de Jalón, P. (Lab. Farmacol. expil. facolta med., Madrid). [*Farmacoterap. actual* (Madrid), **2**, 622-8 (1945).]

The duodenum of the rat gives very regular responses to acetylcholine (I) but the voluntary movements of the muscle are of such amplitude that the interpretation

is difficult. It was found that the addition of 0.15 per cent. MgSO_4 to Ringer solution causes the gut to relax but does not prevent a prompt response to (I). In tyrode solution the relaxation and reduction of amplitude are still better, but the Mg in presence of the Ca of the solution also depresses the response to (I). The response can be re-established by simultaneous sensitization with pantocaine and eserine. The most favorable conditions are obtained with a tyrode solution containing 0.01 per cent. CaCl_2 and 0.1 per cent. MgSO_4 . After submerging the strip of duodenum in the bath of 80 c.c. at $37-8^\circ$ 0.2 mgm. of pantocaine-HCl and 0.01 mgm. of eserine salicylate are added. The test is performed after 5 minutes. Equal doses of (I) between 0.1 and 1 γ give identical contractions. After each test the gut is washed with 300 c.c. of the bath fluid. A. E. MEYER (Chem. Abstr.).

Acetylcholine and Choline Esterase Contents of Small Intestine. Cheng, C. P., Hsin, H. Y., and Hsu, F. H. [*Proc. Chinese Physiol. Soc.*, **1**, 27-30 (1942).]

In rabbits and dogs, choline esterase activity is higher in the muscle than in the mucosa, and in the lower parts of the small intestine than in the duodenum. Acetylcholine can be extracted both from muscle and from the mucosa, and in greater quantity from the upper part of the intestine than from the lower segments. In a rabbit, vagotomized, atropinized, and eserinated, 25.4 per cent. of acetylcholine were synthesized in 10 minutes by the jejunum. These findings are probably related to the higher motor sensitivity of the upper gut to acetylcholine in comparison with the lower gut. B. A. (Chem. Abstr.).

Cholinesterase in Cerebrospinal Fluid. Glasson, B., and Mutrux, S. (Univ. Geneva). [*Helv. Physiol. Pharmacol. Acta*, **4**, C12-14 (1946) (in French).]

The manometric method of Ammon (liberation of CO_2 from NaHCO_3 by the freed acid) was used with two substrates, acetylcholine (I) and monobutyrin (II). Human blood serum was quite active on both (I) and (II) and in both cases the action was almost completely inhibited by eserine (III). Red corpuscles and normal cerebrospinal fluid were strongly active on (I) and this action was inhibited by (III). Corpuscles showed a slight, and cerebrospinal fluid a variable activity towards (II) and this action was unaffected by (III). Cerebrospinal fluid from three cases of oligophrenia was strongly active on (I) and only slightly active on (II).

L. E. GILSON (Chem. Abstr.).

Influence of the Anticholinesterase, Diisopropylfluorophosphate, on Cardiovascular and Respiratory Reflexes of Carotid Sinus Origin. Heymans, C., and Pannier, R. (Univ. of Ghent, Belgium). [*Proc. Soc. Exptl. Biol. Med.*, **26**, 228 (1946).]

In dogs under chloralose anesthesia, intravenous injections of diisopropylfluorophosphate (0.12-1.0 mgm./kgm.) inhibiting completely the cholinesterase activity of the blood do not stimulate the respiratory center and do not affect either the heart rate or the blood pressure. The cardiovascular and respiratory reflexes induced by increase or decrease of the intracarotid sinus pressure are unaffected. These results do not support the theory of a cholinergic transmission of the respiratory and cardiovascular reflexes induced by a physiological stimulation of the carotid sinus pressoreceptors.

L. E. GILSON (Chem. Abstr.).

Studies on Cholinesterase. II. Enzyme Activity and Voltage of the Action Potential in Electric Tissue. Nachmansohn, David, Coates, C. W., and Rothenberg Mortimer A. (Columbia Univ.). [*J. Biol. Chem.*, **163**, 39-48 (1946); cf. C. A., **39**, 3798¹.]

The activity of cholinesterase and the voltage of the action potential were measured simultaneously in the electric organ of a number of specimens of *Electrophorus electricus* confirming and extending previous findings indicating a close parallelism between the two. The direct connection of acetylcholine with the nerve action potential and nerve condition is highly probable.

DAVID B. SABINE (Chem. Abstr.).

Cholinesterases in Degenerating and Regenerating Peripheral Nerves. Sawyer, Charles H. (Duke Univ., Durham, North Carolina). [*Am. J. Physiol.*, **146**, 246-53 (1946).]

The guinea-pig sciatic nerve contains both true cholinesterase (I) and pseudo-cholinesterase (II). Extracts of unoperated nerve hydrolyze mechoyl nearly 60 per cent. as readily as (I) and benzoylcholine only 20 per cent. as rapidly as (I). Wallerian degeneration of the tibial and peroneal nerves is attended, within the first few days after section of the sciatic nerve, by a 60 per cent. loss of their true (I) content. Further loss of the enzyme fails to occur even with the complete disintegration of axis cylinders. (II) activity is unaffected by the operation while (I) hydrolyzing capacity, dependent on the two enzymes, drops 30 per cent. Nearly two-thirds of the true (I) is secreted by the axis cylinders, but more than one-third is produced by some other element or elements, perhaps sheath cells. (II) is probably completely resident in the connective tissue.

E. D. WALTER (Chem. Abstr.).

Choline Esterase and its Specificity. Augustinsson, K. B. (Chem. Inst. of Vet. Coll., Stockholm). [*Nature*, **157**, 587-8 (1946); cf. *C. A.*, **39**, 5258^a.]

A specific cholinesterase is an enzyme which hydrolyzes acetylcholine at a higher rate than any other esters. The whole animal of *Patella vulgata* and the ampulla and podia of *Asterias rubens* from the west coast of Sweden split acetyl- β -methylcholine at a higher rate than acetylcholine. Benzoylcholine is very little split. In contrast, *Terebratulina caput serpentis* hydrolyzes acetylcholine but neither acetyl- β -methylcholine nor benzoylcholine. The reactions used to distinguish between a true and a pseudocholinesterase with the help of two choline esters do not tell the complete story about the types of this enzyme.

E. D. WALTER (Chem. Abstr.).

Specificity of Cholinesterase. Cholinesterase Activity and Phosphatase Activity. Cristol, P., Passouant, P., Benezech, C., and Dutarte, Jeanne (Univ. Montpellier). [*Compt. rend. soc. biol.*, **139**, 312-13 (1945).]

No correlation was found between the variations in cholinesterase activity and phosphatase activity in normal and pathological human serums.

L. E. GILSON (Chem. Abstr.).

Inhibition of Cholinesterase and Activation of Phosphatase in Blood Serum. [*Ibid.*, 314-15.]

Eserine sulfate has no effect on serum phosphatase activity but largely inhibits the cholinesterase activity. MgSO_4 increases the phosphatase activity but not the cholinesterase activity.

L. E. GILSON (Chem. Abstr.).

Absence of Pseudocholinesterase from the Tissues of Ruminants. Gunter, Josephine M. (Univ. of Toronto, Can.). [*Nature*, **157**, 369 (1946).]

Tissues of ox and sheep which, by their inability to hydrolyze benzoylcholine, were shown to contain no pseudocholinesterase are liver, spleen, pancreas, muscle, gastric mucosa, intestinal mucosa, thyroid gland, and lachrymal gland. This is a further indication of the irrelevance of pseudocholinesterase to the process of nerve impulse transmission.

E. D. WALTER (Chem. Abstr.).

Determination of Histamine in Cerebrospinal Fluid and Blood in Some Cases of Cerebral Disease. Businco, Lino, and Visalli, Felice (Univ. Rome). [*Boll. soc. ital. biol. sper.*, **16**, 258-9 (1941).]

In 5 patients with brain tumors the blood contained 0.04-0.10 γ of histamine per c.c. and the cerebrospinal fluid not more than 0.02 γ /c.c.

L. E. GILSON (Chem. Abstr.).

Free Aneurine Content of Cerebrospinal Fluid. Cacioppo, Filippo (Univ., Palermo, Italy). [Boll. soc. ital. biol. sper., **20**, 83-4 (1945).]

In a study of 29 children, the cerebrospinal fluid showed no appreciable variations in aneurine content in cases of diphtheria or poliomyelitis. The aneurine titer was greatly increased in cases of tubercular meningitis.

HELEN LEE GRUEHL (Chem. Abstr.).

Effect of Morphine on Cerebrospinal Fluid Pressure. Chou, C. [Proc. Chinese Physiol. Soc., **1**, 97-101 (1942).]

In dogs under urethan, paraldehyde, or phenobarbital, morphine (0.25-1 mgm. per kgm.) decreased cerebrospinal fluid pressure simultaneously with blood pressure in 9 out of 16 animals. In the remaining 7 animals, cerebrospinal fluid pressure increased, while the blood pressure remained unaltered or decreased. Changes of cerebrospinal fluid pressure are the result of the balance of the action of the drug on local cerebral circulation and on systemic blood pressure.

B. A. (Chem. Abstr.).

The Specific Gravity of Spinal Fluid. A Review of Methods and the Application of a Newer Micromethod in Spinal Anesthesia. Wolman, Irving J., Evans, Barnett, and Lasker, Sigmund (U.S. Public Health Service Hospital, Sheepshead Bay, Brooklyn). [Am. J. Clin. Path., Tech. Sect., **10**, 33-9 (1946).]

The following method was simple and accurate. Fill the lower part of a 2,000 c.c. graduated cylinder with paraffin so that the mouth of a 250 c.c. graduated cylinder centered in it will protrude about 1 inch. Fill the space between the cylinders with water for insulation, adding a few drops of H_2SO_4 and a few crystals of $CuSO_4$ as preservative. Cover with paraffin. Prepare the gradient mixture by blending 31 c.c. of bromobenzene (specific gravity 1.94) with 94 c.c. of tech. kerosene (sp. gr. 0.81) producing a light mixture (sp. gr. 0.97). To produce a heavy mixture (sp. gr. about 1.05), blend 47.5 c.c. bromobenzene with 77.5 c.c. of kerosene. For a gradient between sp. gr. 1.000 and 1.0200 with extremes from 0.97 to about 1.05, pour the heavier mixture into the inner cylinder to the 125 c.c. mark, and overlay it with the lighter mixture to the 250 c.c. mark. To produce the gradient insert a piece of 16 gauge Cu wire coiled to form a disc with a long handle to the level of the interface two or three times with a 1 inch stroke into each phase. Increase the stroke by 1 inch and repeat. Continue this until only 1 inch of the top and bottom is undisturbed. Calibrate with NaCl solutions of known sp. gr., checking each day of use for changes due to diffusion, temperature, etc. Add drops of the spinal fluid to be tested, of the same size used in calibration and read the sp. gr. from the graduations on the cylinder. The sp. gr. of spinal fluid from persons free from disease of the central nervous system was found to be 1.0062-1.0082, with a mean of 1.00697, at 25 degrees. A few specimens from subjects with syphilis of the central nervous system were elevated above this range.

JOHN T. MYERS (Chem. Abstr.).

Action of Aneurine and Riboflavin on Isolated Intestine and their Functional Relationships to Acetylcholine and Adrenaline. Sanz Sanchez, F. [Farmacoterap. actual (Madrid), **1**, No. 3, 43-51 (1944).]

Aneurine inhibits the isolated intestine of rabbits and increases the action of adrenaline. Acetylcholine is less effective after administration of aneurine. Lactoflavin inhibits the intestine and does not modify the action of adrenaline or acetylcholine.

B. A. (Chem. Abstr.).

Mental Response to Added Thiamine. Harrell, Ruth F. (Columbia Univ.). [J. Nutrition, **31**, 283-98 (1946).]

During three periods of time the effect was observed of daily supplementation of the dietary of an orphanage with 2 mgm. of thiamine per child. Thirty-seven to 55 carefully matched pairs of children were used, one member of each pair receiving thiamine and the other a placebo. Measurements of performance included acuity of vision, skills at games, reaction time, reading, arithmetical processes,

memorizing and forgetting, intelligence tests, and other recognized measures in current use by psychologists. In the first period of 6 weeks the vitamin-fed group made superior average gains in performance in every one of the 18 test tasks. The individual variations in gains within each group were within the limits of probable error in the case of 7 of these tasks. In the second period of 1 year, 15 activities were used and the vitamin-fed group again surpassed the control group in gains in performance in every activity. The superior gain for the vitamin-fed group was statistically significant for 8 of the 15 activities. In the third period of 1 year, without knowledge of the participants, 20 pairs of children were continued with the same regime as in the previous year while 20 pairs were reversed, so that those who had received the thiamine now received the placebo and *vice versa*. The unreversed pairs continued to show superiority of average performance for the thiamine-fed group in all 11 tests used; the reversed pairs showed reversals of superior gain in 7 activities but failed to show adverse effects of withdrawal of thiamine in intelligence tests, educational achievement, reaction time, height or weight gains. The children received from 0.9 to 1.0 mg. thiamine daily in their normal diet.

W. B. ESSELEN, JUN. (Chem. Abstr.).

Disturbances of Neuromuscular Excitability During Dietary Imbalance and Avitaminoses. VI. Antialkalotic Action of Ascorbic Acid and Vitamin D (Calciferol, Lecoq, Raoul, Chauchard, Paul, and Mazoue, Henriette (La Sorbonne, Paris). [Bull. soc. chim. biol., 27, 358-63 (1945); cf. C. A., 40, 1911⁹.]

For action of ascorbic acid, see C. A., 40, 3513⁹. Calciferol acts in a similar fashion.

L. E. GILSON (Chem. Abstr.).

VII. Alkalosis in Experimental Rickets. [Ibid., 364-76.]

In rickets the bone lesions and the neuromuscular troubles due to alkalosis develop independently. Administration of ascorbic acid prevents only the latter, vitamin D prevents or cures both.

L. E. GILSON (Chem. Abstr.).

Vitamins Antagonizing the Action of Thyroxine on Nerve Chronaxia. Chauchard, Paul, and Mazoue, Henriette (École hautes études, Paris). [Compt. rend. soc. biol., 139, 594-5 (1945).]

The shortening of nerve chronaxia in pigeons produced by thyroxine is antagonized by ascorbic acid, thiamine, riboflavin, nicotinamide, or pantothenic acid, but not by vitamins A or D, or glutathione, cysteine, or methionine.

L. E. GILSON (Chem. Abstr.).

Biochemical Study of Avitaminoses of the Pellagra Group. IX. Influence of Riboflavin on the Nicotinamide Content of Livers of Rats on Certain Synthetic Diets. Raoul, Y. (Hôpital Foch, Paris). [Bull. soc. chim. biol., 27, 371-3 (1945); cf. C. A., 40, 3510².]

The distribution of nicotinamide (plus nicotinic acid) in different parts of the rat liver is very irregular; hence an accurate estimate cannot be made from analysis of a small sample from one lobe. The entire liver should be sampled. A deficiency of riboflavin in the diet frequently causes an important decrease in liver nicotinamide. This should be of interest in connection with human pellagra.

L. E. GILSON (Chem. Abstr.).

Biochemical Study of Avitaminoses of the Pellagra Group. X. Is Cutaneous Excretion of Porphyrin by the Rat a Sign of Pantothenic Acid Deficiency? Raoul, Y., and Marnay, C. (Hôpital Foch, Paris). [Bull. soc. chim. biol., 27, 502-8 (1945); cf. C. A., 40, 3510².]

The absence of either pantothenic acid or pyridoxine, especially the latter, in the diet results in cutaneous excretion of protoporphyrin by the rat. Choline may have a slight protective action.

L. E. GILSON (Chem. Abstr.).

XI. Changes in the Porphyrins of Biological Media under the Influence of Dietary Imbalance. [*Ibid.*, 509-13.]

Rats on diets deficient in pantothenic acid or pyridoxine, or both, showed cutaneous excretion of protoporphyrin without other porphyrins and at the same time an increase in urinary excretion of coproporphyrin. Their livers contained free protoporphyrin, while livers from normal rats contained none. Feeding rats a Goldberger maize diet did not cause cutaneous excretion of protoporphyrin and did not increase the urinary excretion of coproporphyrin (normal is 4.8-5.8% per cent.).

L. E. GILSON (Chem. Abstr.).

Structure of the Liver in Pellagra. Gillman, J., and Gillman, T. (Univ. Witwatersrand, Johannesburg, S.A.). [*Arch. Path.*, **40**, 239-63 (1945).]

By means of an improved biopsy technique, the changes in the liver in pellagra have been studied. Fatty livers are found in children, and fat and pigment (cytosiderin and cytolipochrome) are found together or separately in the livers of adults. Pigmentary cirrhosis is common in adults, and is indistinguishable from hemochromatosis. These changes represent the reaction of the liver to acute or chronic malnutrition.

M. L. C. BERNHEIM (Chem. Abstr.).

Ultraviolet Absorption of Living Nerve Fibers. Lüthy, H. (Hallerianum, Bern). [*Helv. Physiol. Pharmacol. Acta*, **4**, C20-2 (1946) (in German).]

The apparatus and method are described. The ultraviolet absorption curve of a frog nerve is shown for the range 250-320 m μ . The curve shows a small peak at 290 m μ due to tyrosine, a high peak at 265-70 m μ due to unknown constituents, a dip at 258 m μ , and complete absorption at 250 m μ .

L. E. GILSON (Chem. Abstr.).

Indicanorachia under Physiological and Pathological Conditions. Tinelli, Giuseppe. [*Ibid.*, 172-3.]

Indican was present in normal human cerebrospinal fluid in amounts of 23.7% / 100 gm. Under various pathological conditions (meningitis, luetic nervous conditions, etc.) the indican increased to an average of 67.5% / 100 gm.

The Effect of Removal of the Suprarenal Capsule on the Neuromuscular System and the Effect of the Injection of Desoxycorticosterone Acetate. Chauchard, Paul (École hautes études, Sorbonne, Paris). [*Ann. d'endocrinol.*, **4**, 257-8 (1943); *Chem. Zentr.*, **11**, 227 (1944).]

Chronaximetric measurements on young rats from which the suprarenal capsule had been removed showed that the asthenia observed in such animals is of encephalic origin and that the musculature does not experience a depressor but rather an excitor action. The principal effect of desoxycorticosterone acetate on normal animals is always a muscular excitation and, depending on the dose, an excitation or depression of the nervous centers. In the case of animals from which the suprarenal capsule had been removed or in scorbutic animals the above hormone showed a corrective effect on the chronaxia phenomena.

M. G. MOORE (Chem. Abstr.).

The Diencephalic-hypophysial Centers and Uric Acid Exchange. Ferrannini, Alfredo (Univ. Bari, Italy). [*Boll. soc. ital. biol. sper.*, **15**, 782-4 (1940).]

Blood uric acid curves after intravenous injection of uric acid (50 c.c. of Koehler's solution) were determined for patients with lesions of the diencephalic-hypophysial region and for normal subjects. The results were irregular and inconclusive.

L. E. GILSON (Chem. Abstr.).

Uric Acid Exchange in Chronic Encephalitis. [*Ibid.*, 785-6.]

Patients with lesions in the diencephalon resulting from encephalitis were given uric acid intravenously (50 c.c. of Koehler's solution) and the rate of disappearance of the uric acid from the blood determined. The rate seemed to be a little slower than in normal subjects.

L. E. GILSON (Chem. Abstr.).

Influence of Magnesium on Chronaxia of Nerve and Muscle. Bartorelli, Cesare (Univ., Bologna). [Boll. soc. ital. biol. sper., **15**, 621-2 (1940).]

Frog nerve-muscle preparations were used. Addition of $MgCl_2$ to the bath solution prolonged nerve chronaxia and shortened muscle chronaxia, but increased the rheobase of both nerve and muscle. The effects were reversible.

L. E. GILSON (Chem. Abstr.).

Effect of Anoxia on Nervous Excitability in Man. Beyne, J., Chauchard, B., and Chauchard, P. (Sorbonne). [Compt. rend. soc. biol., **139**, 929-30 (1945).]

Partial anoxia without hypercapnia prolongs the chronaxia of the motor nerves.

L. E. GILSON (Chem. Abstr.).

Effects of Aminothiazole and Thyroxine on Chronaxia. Chauchard, Paul (Sorbonne). [Compt. rend. soc. biol., **139**, 925-6 (1945).]

In pigeons the injection of 50 mgm. of aminothiazole daily for 2 days causes a decrease in basal metabolism and a lengthening of nerve and muscle chronaxia. The oral administration of thyroxine to normal pigeons or pigeons treated with aminothiazole causes an increase in basal metabolism, and a decrease in chronaxia to considerably below normal.

L. E. GILSON (Chem. Abstr.).

Oxygen Poisoning. III. The Effect of High Oxygen Pressures upon the Metabolism of Brain. Stadie, William C., Riggs, Benjamin C., and Haugaard, Niels (Univ. of Pennsylvania, Philadelphia). [J. Biol. Chem., **160**, 191-208 (1945); cf. C. A., **38**, 1560².]

The metabolic activity *in vitro* of tissues surviving exposure to high O pressures in comparison with similar tissues under normal O tension was studied in an effort to determine the mechanism of O poisoning. Toxic effects developed rapidly in rats exposed to 8 atmosphere of O culminating in convulsions, and practically all animals exposed for 30 minutes died, either during exposure or within a few hours after decompression. Oxygen poisoning, however, was completely reversible up to a certain point, because if animals were decompressed relatively early, many recovered even though severe convulsions had occurred. Hemorrhagic patches in the lungs and intestines were observed at autopsy. Gross examination of the brain, on the other hand, revealed no changes. Thin slices of tissue from animals killed by high O pressures showed no significant changes in total O intake or respiratory quotient when examined in the Warburg apparatus under normal O tension. Similar preparations from animals exposed during a preliminary period to high O pressures and later observed in the Warburg apparatus under normal O tension manifested a steadily decreasing rate of O intake proportional to the O pressure employed and the time of exposure. Inhibition of brain metabolism by high O pressure was similar with glucose, fructose, pyruvate, or lactate as substrate. Similar findings were obtained when normal tissue was observed at 8 atmosphere of O, a 50 per cent. reduction in the initial O uptake being detected within 1 hour. The fact that the time required for appreciable reduction in the rate of O uptake was far greater than for the production of serious symptoms, convulsions and death when intact animals are subjected to the same O pressures appears significant in connection with the mechanism of O poisoning. Brain slices subjected to relatively high pressures of CO_2 (up to 107 mm. of Hg) in addition to 8 atmosphere of O were no more susceptible to O poisoning than those exposed to 8 atmosphere of O alone. Furthermore, the metabolism of brain tissue *in vitro*, although diminished in rate, was not altered from its predominantly high carbohydrate character by high O pressures. Attempts to reverse the lowered O uptake of tissue poisoned by O with early return to normal O tension failed. The rate of O uptake by tissues *in vitro* in a normal atmosphere was not affected by 7 additional atmospheres of N or H. The data obtained are discussed in relation to the mechanism of acute O poisoning.

D. W. MCKINSTRY (Chem. Abstr.).

Suction Type of Electrode for Electroencephalography. Rice, H. V. [Can. J. Research, **23E**, 19-21 (1945).]

The electrode is constructed from Pb-coated brass tubing with an upper rubber diaphragm to facilitate application by suction.

B. A. (Chem. Abstr.).

Photosensitivity as a Cause of Falsely Positive Cephalincholesterol Flocculation Tests.
Moses, C. [*J. Lab. Clin. Med.*, **30**, 267-9 (1945).]

The photosensitivity of the cephalin-cholesterol flocculation reaction is confirmed. Since this reaction occurs in artificial light as well as in sunlight, it is not due to any property peculiar to the latter. It is not due to heat generated in the sample by light.

B. A. (Chem. Abstr.).

Consumption of Oxygen and Muscular Work During the Crisis of Electric Shock.
Delmas-Marsalet, P., Servantie, L., Faure, J., and Pouyanne, H. (*Hôpital Saint-André, Bordeaux*). [*Compt. rend. soc. biol.*, **139**, 845-6 (1945).]

During the first minute of convulsions produced by electric shock treatment O consumption often increases to 6-8 times the basal rate. At the same time blood lactic acid increases to 2-3 times normal. These effects are due to the intense muscular activity. A 52-year old man was studied.

L. E. GILSON (Chem. Abstr.).

Biochemical and Physiological Differentiation During Morphogenesis. VI. Succinic Dehydrogenase and Succinic Oxidase in the Cerebral Cortex of the Fetal Pig.
Flexner, Louis B., and Flexner, Josefa B. (Carnegie Institution of Washington, Baltimore, Md.). [*J. Cellular Comp. Physiol.*, **27**, 35-42 (1946); cf. *C. A.*, **36**, 1075¹.]

In early fetal life succinic dehydrogenase activity of the cerebral cortex is approximately 35 per cent. of the adult value. Between 68 and 75 days the activity begins to increase and reaches the adult level at birth. Succinic oxidase activity is low or absent up to about 66 days. It then increases to birth when it is equal to that of the adult. The low activity in early stages of gestation is ascribed to the low cytochrome c activity.

H. L. MASON (Chem. Abstr.).

Contributions to the Study of the General Physiology of Nerve Centers. I. Central Summation. Bremer, F., Bonnet, V., and Moldaver, J. (*Lab. Path. Generale of Univ. of Brussels*). [*Arch. Intern. Physiol.*, **52**, 1-56 (1942).]

The latent central addition of two impulses of afferent influx has been studied in the frog and toad (spinal animals, decerebrated or intact) for homolateral and contralateral reflexes of the posterior limb. The non-barbiturate narcotics, as well as convulsive agents in doses affecting an isolated stimulus, do not change the shape of the summation curve; they only modify the heights of the ordinate; barbiturates (particularly veronal) depress the second summit of the curve. Physiological aspects of the subject are reported.

D. A. MEYER (Chem. Abstr.).

II. Inhibition Reflex. Bremer, F., and Bonnet, V. [*Ibid.*, 153-94.]

The inhibition reflex is provoked in the spinal frog by a single induction shock to a sensitive nerve. While the reflex of the flexion of a posterior member is disturbed by the latent addition of two rupture shocks applied on the afferent sciatic and while the summation curve of this reflex is of a simple type, the precision of an identical or feebler induction shock (stimulus S_1), exciting the same sensitive nerve, has the regular effect of inhibition of response to the stimuli $S_2 + S_3$. This inhibition can proceed to the complete suppression of the reflex. Strychnine and catelectrotonus intensify the excito-motor effect of $S_2 + S_3$ and the inhibiting effect of S_1 , depressor agents (central fatigue, narcotics, anelectrotonus) weaken one another.

D. A. MEYER (Chem. Abstr.).

III. The After-discharge Reflex and the Neuro-chemical Theory of Central Activation. Bremer, F., Bonnet, V., and Moldaver, J. [*Ibid.*, 215-48.]

Data indicate that the primary discharge reflex and the after-discharge are the central determinants, distinct and relatively independent: (a) they have different laws of summation; (b) they have different sensitivities to various physical and pharmacological agents, in the sense of a reinforcement or weakening more or less elective of the after-discharge by certain agents, and reciprocally of a much more marked action of other agents on the primary discharge; the after-discharge is

notably strengthened electively by catelectrotonus, K, nicotine, acetylcholine, choline, eserine, and prostigmine, while the action of strychnine applies especially to the primary discharge; it is electively depressed by anelectrotonus and by the barbiturates, especially by veronal.

D. A. MEYER (Chem. Abstr.).

Pentosenucleoproteins and Neural Induction. Brachet, J. [Bull. classe sci., Acad. roy. Belg., **29**, 707-18 (1943) (Pub., 1945).]

Nucleoproteins, nucleic acids and certain of their derivatives have induction capacities for the nervous system of amphibians. During invagination of the batrachian embryo, the amount of ribonucleic acid increases in the embryonic nervous system, while it diminishes elsewhere. Zymonucleic acid, in yeast, has its origin in the active derivatives of glucidic metabolism, notably 5-adenylic acid. The hydrocarbon metabolism of the gastrula is most intense in the region where the amount of ribonucleic acid in the cells varies the most; this denotes growth and organization. The synthesis of proteins has been correlated with the presence of large amounts of pentosenucleic acid, although the manner in which it acts is obscure. The splitting of proteins plays a major role in muscular contraction and presumably also in cell division. Recent researches have shown the existence of elongated molecules in the neural plaque of the hen, and the particular form of these cells of the medullary plaque is in harmony with the existence of this type of molecule.

D. A. MEYER (Chem. Abstr.).

Changes in the Excitability of the Respiratory Centers of Aviators in a State of Fatigue. Franck, C., Grandpierre, R., Santenaise, D., and Stankoff, E. [Compt. rend. soc. biol., **139**, 835-6 (1945).]

The fatigued state is characterized by an increase in blood CO_2 and a decrease in the sensitivity of the respiratory centers to changes in alveolar CO_2 . Normally, the threshold of increase in pulmonary ventilation is 1-2 per cent. of CO_2 in the inspired air, but in the fatigued state this is raised to 3-6 per cent.

L. E. GILSON (Chem. Abstr.).

Urinary Excretion of Estrogenic Substances by Women Before and After Electric-shock Treatment. Bergouignan, M., and Demange, R. [Compt. rend. soc. biol., **139**, 848-50 (1945).]

The results of electric shock treatment as practiced in insane hospitals were inconclusive. Possibly the excretion of estrogens was slightly increased in a few cases.

L. E. GILSON (Chem. Abstr.).

Cerebral Lipides in Acute Aniline Poisoning. I. Determination of Cerebral Lipides by the Method of Frankel. Tarsitano, Francisco (Univ. Naples). [Folia med. (Naples), **27**, 830-5 (1941).]

Since the nervous system is particularly involved in aniline (1) poisoning, an examination of the changes which are produced in the brain was undertaken. Rabbits given subcutaneously 1.5 gm. of (1) per kgm. of body weight died within 24 hours. Following the method of Frankel, the brains of rabbits treated with (1), and of controls were subjected to (1) cold extraction by Me_2CO for 24 hours; (2) hot extraction by Me_2CO for 24 hours; (3) extraction by petr. ether for 48 hours; (4) extraction by C_6H_6 for 48 hours; (5) extraction by absolute alcohol for 48 hours, and (6) extraction by Et_2O for 48 hours. In (1) and (2), H_2O , cholesterol, and some unsaturated phosphatides are separated; in (3) unsaturated phosphatides and cerebroside; in (4), (5) and (6) the saturated phosphatides and remaining cerebroside. The values found for 5 treated and 5 control animals are, respectively, H_2O , 76.80-77.42 per cent. and 74.90-77.20 per cent.; (1) and (2) (per cent. of dry weight) 22.15-25.00 and 23.90-26.62; (3) 24.97-26.08 and 22.55-26.40; (4) 12.66-15.03 and 11.90-13.58; (5) 4.59-5.55 and 4.44-5.74, and (6) 0.69-1.39 and 0.73-1.45. The total lipides, then, range from 68.35-71.18 in treated animals and from 68.08-71.40 in controls on a dry weight basis. The effects on the brain of treatment with (1) appear to be an increase in H_2O , decrease in (1) and (2), increase in (3) and (4), with little change in (5) and (6) or in the total lipides.

WILLIAM F. BRUCE (Chem. Abstr.).

Mechanism of Action of Sympathomimetic Amines. III. Oxidation of Tyrosine by Rat-liver Homogenates. Govier, Wm. M., Grelis, Mary E., Yanz, Naomi S., and Beyer, Karl H. (Sharp and Dohme, Inc., Glenolden, Pa.). [*J. Pharmacol.*, **87**, 149-58 (1946); cf. *C. A.*, **40**, 1228°.]

The oxidation of tyrosine by rat liver homogenate is stimulated by cytochrome c, coenzyme (I), α -keto acids, low concentrations of methylene blue, and by Al and Ca ions. p-Hydroxy-phenylacetic acid is strongly inhibitory to both tyrosine oxidation and tissue respiration. A possible mechanism of the reactions is discussed which suggests that "amine oxidase" is a mixture of several enzymes.

L. E. GILSON (Chem. Abstr.).

Action of Some Zoösteroids on the Excitability and Fatigability of Neuromuscular Preparations. Borgatti, G. [*Arch. sci. biol. (Italy)*, **29**, 160-88 (1943).]

Some zoösterols, and more specifically cholesterol, cholic acid, corticosterone, and testosterone were studied by chronaximetric and ergographic methods in regard to the excitability and work done by nerve-muscle preparations. All exhibited a positive neuromyotropic effect on the excitability and contractility of muscle. Corticosterone tended to hasten the return of isochronism between nerve and muscle which is necessary for transmission of an impulse, and the muscle under its influence also did more work. Cholic acid also favored the renewal of nervous excitability after fatigue, but exerted a negative action on work performance. Cholesterol and testosterone did not have a clear-cut effect. The common action of the various compounds on excitability is attributed to the common nucleus of these sterols, while the differences between them in respect to other neuromuscular activities are ascribed to the peculiar properties introduced by the different chemical side chains.

D. I. MACHT (Chem. Abstr.).

The Chemical Excitation of the Cerebral Cortex. Moussatche, H. (*Inst. Oswaldo Cruz, Rio de Janeiro*). [*Mem. inst. Oswaldo Cruz*, **42**, 365-400 (1945); cf. *C. A.*, **40**, 1935°.]

Solutions of acetylcholine were applied directly to the motor cortex of dogs, cats, monkeys and rabbits. When 10 per cent. solutions were used, localized muscular twitchings occurred in all animals, and 44.4 per cent. of the animals underwent generalized epileptic convulsions. Convulsions also occurred in some of the animals when 1 per cent. solutions were used and definite responses were generally observed with 0.2 per cent. acetylcholine. Convulsions were easily produced by rapid, light mechanical stimulations of the skin covering the muscles connected to the motor points. Eserine (1:10,000) increased the acetylcholine-induced muscular twitchings, and decreased the acetylcholine concentrations normally necessary to produce generalized epilepsy. Prostigmine injections had no effect, but morphine followed by motor cortex stimulation caused epileptiform convulsions. Nicotine in concentrations from 0.002 per cent. to 50 per cent., was a strong convulsant when applied to the motor cortex. Atropine either applied to the motor points in low concentrations (1:1,000) or injected in high concentrations (3-5 mgm. atropine sulfate) did not prevent the motor reactions of acetylcholine.

BRUNO VASELL (Chem. Abstr.).

A Fourth-action Substance of Nerves. Weidmann, S. (*Hallerianum, Bern*). [*Experientia*, **1**, 61-2 (1945) (in German).]

A fourth, unknown substance (A_4) has been found polarographically in solutions containing cut nerves. More A_4 is found when the nerve is stimulated. An increase is again noted on stimulation after a period of rest. In degeneration the amount steadily decreases. The polarogram of Ringer solution is changed by A_4 so that the rise occurs 1.9 v. earlier. Some properties of A_4 were determined from nerve extracts which showed appreciable amounts of A_4 polarographically. The substance is dialyzable, remains in solution with sulfosalicylic acid precipitation; hence it is not a protein. It is thermostable, its activity not being changed after 2 hours heating at pH 7 in 0.1 N HCl or 0.1 N NaOH. It is destroyed by ultraviolet light. Its activity is dependent on pH.

A. EDELMANN (Chem. Abstr.).

A Depressor Substance Extracted from Rat Intestine. Kahane, Ernest, and Levy, Jeanne (Univ. Paris). [*Bull. soc. chim. biol.*, **27**, 164-7 (1945).]

When dog intestine or stomach or rat intestine, lung, or brain is ground with Tyrode solution there passes into solution a substance M which, when the extract is heated to 70°, liberates an unidentified substance X. The latter provokes the contraction of leech muscle with or without pretreatment with eserine. The substance X is stable upon boiling in weakly acid or alkaline solution. Its chemical and pharmacological properties show it is not choline or a choline ester, a K salt, histamine, adenosine, the substance P of Euler and Gaddum (*C. A.*, **25**, 5440), the substance R of Chang and Wong (*C. A.*, **27**, 5395), or the depressor substance extracted from blood by alcohol by Fleisch (*Schweiz. Med. Wochen.*, **68**, 81 [1938]). In some respects it resembles the vasodilator substance extracted from fresh blood by Fleisch and Gavin-Franel (*C. A.*, **30**, 4221⁸). L. E. GILSON (Chem. Abstr.).

Chemical Bases of Nerve Impulse Transmission. Rosenbaum, H. [*Compt. rend. ann. et arch. soc. turque sci. phys. nat.*, Nos. 8-9, 92-104 (1939-42) (Pub., 1943) (in German).]

Review and critic discussion. Conclusion: transmission of nerve impulses is not entirely dependent upon chemical reactions; other non-chemical factors play an important part. BRUNO VASSEL (Chem. Abstr.).

Modification of the Regnier Chronaxia Method for the Measurement of the Excitability of Sensory Nerves under Local Anesthetics. Quevauviller, A. (Faculté de Pharmacie de Paris, France). [*Arch. Intern. Pharmacodynamie*, **69**, 361-81 (1944).]

A modification of the method (*C. A.*, **39**, 3356⁸) and a theoretical discussion of chronaxias and a calculation of the electric energy necessary to elicit the crossed extension reflex of the frog under certain conditions are given. Ringer-glucose solutions are necessary for stabilization of the nerve. Novocaine first lowers then raises the chronaxia, but the phase of lowered chronaxia does not correspond to the phase of pre-anesthetic hyperexcitability.

M. L. C. BERNHEIM (Chem. Abstr.).

Toxic Effects of Oxygen and of Hydrogen Peroxide on Brain Metabolism. Mann, P. J. G., and Quastel, J. H. (City Mental Hosp., Cardiff). [*Biochem. J.*, **40**, 139-44 (1946); cf. following abstract.]

The respiration of minced brain tissue, especially in the presence of glucose, Na lactate or pyruvate, is smaller in O₂ than in air. In the presence of Na succinate the respiration is not quite so sensitive to O₂. Neither the lactic dehydrogenase nor diaphorase is inhibited by exposure of brain tissue to O₂. It appears that the part of the brain respiration system most sensitive to O₂ is the pyruvate oxidizing system. Xanthine oxidase is poisoned by O₂ probably through the intermediate formation of H₂O₂, while d-amino acid oxidase, though it is poisoned by O₂, can be protected by its substrate. The thiol enzyme pyruvic oxidase is thought to be the factor inhibited by high O₂ tensions, but this may be due either to O₂ or to H₂O₂. The toxic effect of the latter is especially noted in the presence of NaN₃.

S. MORGULIS (Chem. Abstr.).

Toxic Effects of Oxygen on Brain Metabolism and on Tissue Enzymes. I. Brain Metabolism. Dickens, F. (Natl. Inst. Med. Research, London, N.W.3). [*Biochem. J.*, **40**, 145-71 (1946); cf. preceding abstract.]

Respiration of brain tissue is slowly and irreversibly poisoned by exposure to high O₂ pressure (H.O.P.). The injury begins at 1 atmosphere and the rate steadily increases with rising pressure. At pressures of 1 to 5 atmospheres the time of exposure necessary to produce a certain percentage of poisoning is more or less inversely proportional to the O₂ pressure. A plot of the course of poisoning of the respiration of brain tissue against time of exposure gives a sigmoid shape similar to that of a probability curve. The metabolism of the O₂ poisoned brain tissue could not be restored to normal by any methods tried, including return to normal

pressure. This poisoning is probably responsible for the convulsions under H.O.P. The order of sensitivity of the respiration of rat tissues to O_2 is as follows:—Brain cortex (finely ground) > brain cortex (slices) > spinal cord > liver > testis > kidney > lung > muscle. The oxidation of glucose, fructose, lactate, and pyruvate by poisoned brain tissue are all affected, but the ability to oxidize succinate is much less affected. The ability of the brain tissue to oxidize glucose decreases at the same rate as the ability to form lactic acid, and in each case the effect is irreversible. Traces of H_2O_2 poison brain respiration, the succinate oxidation being more sensitive. Poisoning with H_2O_2 , unlike that by O_2 , is much less severe in a catalase-rich tissue (liver) than in a catalase-poor tissue (brain). But no accumulation of H_2O_2 could be demonstrated in brain tissue under H.O.P. and the poisoning effect could not thus be ascribed to the formation of H_2O_2 . Neither was the course of H.O.P. poisoning of the brain appreciably affected by the addition of vitamins B_1 , B_2 , B_6 , and C, pantothenic acid, nicotinamide, adenylic acid, adenine, adenosine, cozymase, flavoprotein, fructose, pyruvate, α -ketoglutarate, NaBr, luminal, chloretone, or EtOH. Glutathione, SH-compounds, NH_4Cl , glutamic acid, or glutamine (0.001 M) increased the susceptibility of brain tissue to poisoning by H.O.P. The respiration of brain-cortex slices was protected against injury by H.O.P. by the following divalent metals: $Mn > Co > Mg > Ca$. Fe, Ni, or Cu had a slight protective action, but not Zn. In 5×10^{-5} M or higher concentration Co and Mn were very effective or almost completely counteracted the toxic action of H.O.P. but they could not restore an already poisoned respiration. It is suggested that H.O.P. poisons primarily the pyruvate oxidase system, probably by attacking the SH-groups of the enzyme, which are both activated and protected by Mg, Mn, and Co. Inhibition of this enzymic system would interfere with the oxidation of glucose, fructose, and lactate by blocking the regeneration of adenosine triphosphate. It would also inhibit lactic acid formation from glucose. However, it is not denied that other O_2 sensitive enzymes may also be affected by the toxic action of H.O.P.

S. MORGULIS (Chem. Abstr.).

II. Tissue Enzymes. [*Ibid.*, 171–87 (1946).]

At least 5 enzymes (phosphoglucomutase, fructose-6-phosphate phosphorylase, triosephosphate dehydrogenase, succinic dehydrogenase, and pyruvic oxidase) concerned in the carbohydrate metabolism of brain tissue can be inhibited by O_2 , and of these, 4 are known to depend upon intact SH-groups for their activity. The connection is clear between their—SH nature and liability to O_2 poisoning, which agrees well with the knowledge of O_2 sensitivity of other—SH enzymes. Succinic oxidase system is inhibited by exposure to H.O.P. Its most sensitive component, the dehydrogenase, is apparently irreversibly poisoned. The accumulation of oxalacetic acid probably accounts only for a very small part of the poisoning effect. Both malonate (10^{-3} M) and Mn ions (2.5×10^{-4} M) protect the dehydrogenase against the H.O.P. Cytochrome oxidase may also be somewhat poisoned by prolonged exposure to H.O.P. Lactic and malic acid dehydrogenases from animal tissues are very resistant to inactivation by H.O.P. Triosephosphate dehydrogenase is poisoned only when exposed to H.O.P. in the absence of cozymase. Typical flavoproteins (d-amino acid oxidase, diaphorase) are not affected by H.O.P., even up to 4.4 atmospheres O_2 , while the flavine-adeninedinucleotide content of the brain tissue is not affected by exposure to 3.3 atmospheres O_2 . Catalase is insensitive to O_2 but choline oxidase which is a—SH enzyme is poisoned. Yeast hexokinase is not affected by O_2 in the presence of glucose. The relationship between the presence of essential—SH groups in the enzymes sensitive to O_2 exposure is stressed.

S. MORGULIS (Chem. Abstr.).

Metabolism of Brain Suspensions. III. Respiration at Low Oxygen Tension.
Elliott, K. A. C., and Henry, Maryon (McGill Univ., Montreal. [*J. Biol. Chem.*, **163**, 351–60 (1946); cf. *C. A.*, **37**, 924⁴].

The rate of respiration of brain tissue has been studied with Barcroft differential manometers, and suspensions of whole rat brain homogenates in warm Ringer, 0.033 M phosphate, 0.01 M glucose medium. The gas to be used was passed in series through the vessels before warming it in the 38° bath. Small O concentrations were determined in Barcroft manometers with N NaOH in both

vessels. The gas was passed through the manometers in series and after equilibrium in the bath 0.8 c.c. M NaCl in 0.002 N H_2SO_4 + 0.1 M pyrogallol was added from the side arm of one vessel. Formulas are given for determination of O. The results show the rate of respiration is unaffected by reduction of O tension to as low as 4 mm. of Hg provided the rate of diffusion of O into the suspension medium does not limit O uptake. The rate of diffusion can be increased by decreasing the tissue concentration or by increasing the rate of shaking. The full rate of respiration was obtained with a glucose concentration as low as 10^{-4} M.

E. G. SHIPLEY (Chem. Abstr.).

IV. Anaerobic Glycolysis. [*Ibid.*, 361-74.]

Homogenized rat brain was suspended in warm Ringer-bicarbonate-glucose medium, and glycolysis was followed manometrically in the Barcroft apparatus. The results showed that the maximum stimulation to glycolysis by pyruvate was reached with 5×10^{-5} M pyruvate. A preliminary period of aerobiosis briefly stimulated, and a trace of O will continuously stimulate glycolysis. The rate of glycolysis was stimulated by washing the suspension; the effect was due to removal of a system which destroys pyruvate. Washed suspensions were found to contain increased amounts of pyruvate during the period of stimulated glycolysis. By adding the washings to fresh suspensions of brain glycolysis was inhibited. The inhibitory effect was largely abolished by adding pyruvate. An increase in concentration of tissue decreased glycolysis per unit weight of tissue, and was not all due to an increase in pyruvate destruction. Mg was found to be necessary for stimulation of glycolysis after washing the suspension. Added lactate did not inhibit glycolysis in the absence of added pyruvate, but inhibited glycolysis when pyruvate was added. *Rat and horse serum inhibited glycolysis although serum did not destroy lactate and in itself contained enough pyruvate to stimulate glycolysis. The nature of the inhibitor in serum was not determined. In Ringer-phosphate-glucose medium the lactic acid production was lower than in Ringer-bicarbonate-glucose, but large amounts of unidentified acid were formed. The anaerobic glycolysis of suspensions of whole brain was found to be less variable than that of slices and duplicates agreed very closely, and were nearly the same as the average rate for slices. The possibility that glycolysis is a normal functional process is discussed.

E. G. SHIPLEY (Chem. Abstr.).

The Neuro-muscular Transmission: Curarization, Decurarization, Reinforcement at the Myo-neural Junction. Coppée, G. (Fredericq Inst., Liege). [*Arch. intern. physiol.*, **53**, 327-507 (1943); cf. C. A., **38**, 4319^a.]

Extensive experiments were performed on cat and frog (*Rana esculenta* and *R. temporaria*) muscles, either isolated or *in situ*. The mechanical response of the muscle was registered isometrically upon a smoked cylinder while the electric response was analyzed after amplification by a cathode oscillograph. A functional organelle (designated "motor plate") was found between the termination of the motor nerve and the muscle fibers. Curarization of muscle, just adequate to abolish the mechanical response, followed by an indirect stimulus, produced in the motor plate a brief electric potential followed by a negative after-potential. During neuro-muscular block by K^+ ions or acetylcholine (1) in the presence of eserine, or after section of the motor nerve, the electric response of the muscle to a motor volley is composed of an action potential of the motor plate on which is superimposed an action potential not originating in the muscle fiber; the negative after-potential will be weak, or replaced by a positive after-potential. The response of the motor plate is not determined by (1) liberated at the end of the nerve fiber; the transmission from nerve to plate is assured by an electric mechanism and is characterized by a measurable synaptic delay. The transmission of the excitation from the plate to the muscle fiber occurs as soon as the slow wave exceeds critical voltage; at that moment a brief potential of muscle fiber becomes superimposed on the slow wave. That brief potential may be diffused and accompanied by contraction or not diffused and not accompanied by contraction. The "critical voltage" is conditioned by the excitability of the muscle fibers. Two factors in transmission from plate to muscle fibers are: (1) the energy of the stimulus measured by the amplitude of the slow wave; (2) the excitability of the muscle fibers for that

stimulus. Most of the decurarizing agents (e.g., phenols, guanidine, veratrine, negative polarization) augment the amplitude. K^+ ions augment and Ca^{++} ions depress the excitability of the muscle fibers, and veratrine appears to produce no change in their excitability. The transmission from plate to muscle fiber occurs normally by an electric mechanism similar to that of the nerve impulse along the axone, and is characterized by a non-measurable latent period. Agents which increase the amplitude of the slow wave decrease the delay. (1) is liberated in the motor plate and acts upon the muscle fibers, but it is too weak or too late to assure transmission, which has been assured by the electric mechanism. In specific cases (as with certain muscles of the cat) and on muscle treated with eserine, the (1) liberated by the plate effects excitation of muscle fibers. All the effects from excitation of muscle fibers, of potentiation or depression of neuromuscular transmission produced by (1), can be explained by the intervention of K^+ liberated by the (1). The (1) unites with a radical ($R -$) of an organic K complex to displace K^+ . Normally the $R - (1)$ is rapidly hydrolyzed in the presence of choline esterase, but the compound is not stable and $R - K$ would become reconstituted. The inhibitors of choline esterase hindered the hydrolysis of (1) and stabilized $R - (1)$ and blocked the radical $R -$ for the final reaction (desensitization of muscle to (1)); in addition, the excess of K^+ alters the functioning of the transmission apparatus (this explains the similarity of electric manifestations in muscles curarized by excess K^+ and by (1) in presence of eserine). When stable non-hydrolyzable excitatory substances (quaternary ammonium, nicotine, cytisine) act upon muscle the excitations are equally due to K^+ displaced at the beginning of the $R - K$ complex, but the depression of the neuro-muscular transmission is not due to an excess of the ions. The curarizing agents act upon the motor plate to depress the response to a motor-nerve impulse. The curarizing agents (except the metallic ions) unite with $R -$ of the organic K complex, and produce a progressive leak of muscle K , responsible for depolarization of the motor plate, for lowering the amplitude of the wave from the motor plate, and for the block of transmission from plate to muscle fiber. Ca^{++} and Mg^{++} act as direct antagonists to muscle K^+ . Summation occurs at the interface of nerve and plate and not at plate and muscle fiber. The increased reaction of the plate to the second impulse is due to the negative after-potential produced by the first impulse. When the negative after-potential is absent, there is only a long refractory period. (1) intervenes in summation only at the myo-neural junction. Neuro-muscular transmission can be restored either by increase in amplitude of the slow wave (type: phenol, guanidine, veratrine) or by negative polarization. Decurarization by eserine and the anti-curare action of adrenaline are discussed. Some agents such as guanidine and veratrine are extremely active because they re-establish transmission in myo-neural units and render the muscle fibers repetitive. Reinforcement is concerned either with the repetitive response of muscle fibers (type: eserine, sensitivity to K^+ ions) or with a modification of the muscle contractile apparatus (as by K^+ and an acid pH). Veratrine action is very specific; reinforcement by eserine is due to its anti-esterase activity.

ELVA G. SHIPLEY (Chem. Abstr.).

Modifications of the Phosphorus in Plasma Caused by Anoxia. Cicardo, Vicente H. [Pubs. centro invest. fisiol. (Buenos Aires), 9, 271-81 (1945).]

In dogs in which muscular contraction is abolished by spinal cord destruction or anesthesia the total acid-soluble plasma P increases during asphyxia. Hepatectomy does not modify this increase but surgical shock produces a further rise. Curarizing drugs which cause a drop in plasma P prevent the liberation of P from the tissues. Anoxia by HCN produces an increase of the total acid-soluble plasma P which occurs by way of depression of the respiratory center as is proved by the fact that the increase does not appear if artificial respiration is applied.

A. E. MEYER (Chem. Abstr.).

Further Studies on the Biochemistry of Epilepsy. Madsen, Jrogen (St. Hans' Hosp., Roskilde, Denmark). [Acta Psychiat. Neurol., 18, 257-337 (1943) (in English).]

Hyperammoniurics (usually with epilepsy) showed essentially low normal serum Na, K and Ca, with the Na and Cl falling under the influence of theophyllin, particularly in patients in the convulsive phase. The hyperammoniurics showed

lowered water and increased Na excretion during water diuresis and the excretion of water, Na and Cl after salyrgan injection was variable, and after theophyllin injections the excretions varied with the Na and Cl not always parallel. The normal morning urine Cl/Na ratio is 1:26, but in the epileptics it was found to be 1:55; this indicates a tendency for retention. The ratio fell after diuretic administration and increased after the injection of pitressin. The hyperammoniuria decreased during liver therapy (exhepa). The mechanism of the hyperammoniuria and its control are discussed.

H. L. WILLIAMS (Chem. Abstr.).

Reaction of the Blood in Epilepsy. Faurbye, Arild (Hosp. for Epileptic Dis., Dianalund, Denmark). [*Ibid.*, 419-38 (in English).]

The pH is and remains normal.

H. L. WILLIAMS (Chem. Abstr.).

New Studies on the Variations in Nervous Excitability under the Influence of Different Sugars. Chauchard, Paul, Mazoué, Henriette, and Lecoq, Raoul. [*Compt. Rend.*, 221, 643-5 (1945).]

Whiterats were given daily intraperitoneal injections of 50 mgm. glucose, levulose, galactose, saccharose, maltose, lactose, sorbitol, or mannitol. After the fifth day there was observed a chronaxial effect on the nerves indicative of a depression of the nerve centers. The injection of glucose or levulose into rats produced an immediate chronaxial increase even though the animals were regularly receiving these sugars. The other sugars did not produce this immediate effect.

H. L. G. (Chem. Abstr.).

2. Pharmacology and Treatment.

Experimental Therapy of Acute Barbiturate Poisoning, II. Zancan, Lanfranco (Univ., Padova, Italy). [*Boll. soc. ital. biol. sper.*, 15, 591-2 (1940).]

L. E. GILSON (Chem. Abstr.).

Modification of Chronaxia of Subordination by Diallylbarbiturate. Bartorelli, Cesare (Univ., Bologna). [*Boll. soc. ital. biol. sper.*, 15, 624-5 (1940).]

In rabbits Na 5,5-diallylbarbiturate abolished the state of subordination, of chronaxias producing an equalization of the antagonistic muscles of the hind leg.

L. E. GILSON (Chem. Abstr.).

Toxicity and Narcotic Action of Some Derivatives of Barbituric Acid. Donatelli, L., and Abbate, R. (Univ. Firenze, Italy). [*Boll. soc. ital. biol. sper.*, 15, 838-9 (1940); cf. C. A., 33, 3885?]

Effects of some common barbiturates on rats and rabbits are described.

L. E. GILSON (Chem. Abstr.).

Action on the Heart of Some Derivatives of Barbituric Acid Used as Narcotics. Donatelli, L. [*Ibid.*, 839-40; cf. C. A., 38, 2387?]

Effects of several commonly used barbiturates on isolated frog, rabbit, and guinea-pig hearts, and on the rabbit heart *in situ* are described.

L. E. GILSON (Chem. Abstr.).

Pyruvic Acid Antagonism to Barbiturate Depression. Westfall, B. A. (Univ. of Missouri, Columbia). [*J. Pharmacol.*, 87, 33-7 (1946).]

Data on 64 rabbits anesthetized with Na pentobarbital (40 mgm./kgm. intravenously) indicate that adrenaline increases the blood-sugar level and shortens the sleeping time, insulin decreases the blood sugar and also shortens the sleeping time, and intravenous injection of Na pyruvate decreases the depth of depression and shortens the sleeping time but does not materially alter the total depression time. Adrenaline probably exerts the above action by increasing blood pyruvate and insulin by increasing pyruvate metabolism. All these results suggest that utilization of

pyruvic acid may be the step in carbohydrate metabolism depressed by pentobarbital. The experimental data indicate an inverse relationship between the available pyruvic acid in the blood and the degree of depression produced by the drug.

L. E. GILSON (Chem. Abstr.).

The Determination of Barbiturates in Toxicological and Clinical Investigations. Cohen, Eugene L. (Philadelphia Coll. of Pharmacy and Sci., Pa.). [Am. J. Pharm., **118**, 40-62 (1946).]

The barbiturate-cobalt reaction can be used for quantitative estimations and the optimum wave length for the measurement of the color compound produced in the barbiturate-Co reaction is 5650 Å., with 0.2 ml. of a 1 per cent. cobaltous acetate solution in absolute methanol and 0.6 ml. of 1 per cent. isopropylamine in absolute methanol. Read at this wave length, the color of the reacting agents does not interfere with the color produced in the reaction, and at concentrations of 1 to 10 mgm. of barbiturate per ml. of CHCl_3 solution, the colour produced in the reaction was proportional to the barbiturate content. It is not possible to employ one barbiturate as a standard for the determination of all barbiturates. In like manner, a factor based on the ratio of molecular weights, as is practiced in the determination of the sulfonamide drugs, cannot be employed in the quantitative estimation of the barbiturates. A procedure was devised, based on the Stas-Otto method (cf. Autenrieth, *Lab. Manual for the Detection of Poisons and Powerful Drugs*, C. A., **22**, 1829) for the extraction of the barbiturate drugs from animal tissues, whole blood and urine, requiring a minimum of apparatus and technical skill. By this procedure, recoveries of the barbiturate compounds from tissues and fluids of 93 per cent. or more were obtained in 57 estimations. Possible sources of error were noted and recorded. A simple apparatus was also devised for the purification of the barbiturate drugs by sublimation, prior to identification by m.p. and other determinations.

W. G. G. (Chem. Abstr.).

Effects of Continued Administration of Phenobarbital and Diphenylhydantoin. Hanzlik, P. J., and Laqueur, G. L. (Stanford Univ., San Francisco, Calif.). [Stanford Med. Bull., **4**, 21-32 (1946).]

Phenobarbital (I) and diphenylhydantoin (II) were administered to white rats in concentrations of 0.1 and 0.01 per cent. in the diet over a period of 16 months. The greater injurious effect of (I) as compared with (II) was demonstrated by greater decrease in body weight and growth, greater mortality, more frequent nasal bleeding and encrustation of eyelids, and generally a decreased activity in the group receiving (I). No evidence could be found of antagonism to the effect of feeding (I) by administration of sodium succinate. Animals showing toxic effects of (I) had no anatomically demonstrable changes in the kidneys, liver, brain, heart, lungs, and gonads; however an enlargement of the parenchymatous liver cells was noted in the majority of these cases.

D. A. SHIRLEY (Chem. Abstr.).

Site of Action of Narcotics on Brain Metabolism. Greig, Margaret E. (Vanderbilt Univ. School of Med., Nashville, Tenn.). [J. Pharmacol., **87**, 185-92 (1946).]

Previous experiments have shown that the dehydrogenase and that part of the cytochrome system involved in the oxidation of succinate are relatively insensitive to narcotics. There are two possible oxidation-reduction reactions on which narcotics might exert their effect in inhibiting the carbohydrate metabolism of the brain. They are (1) the transfer of H from reduced cozymase to flavoproteins, and (2) the oxidation of flavoproteins by the cytochrome system by electron transfer. Experiments showed that reduced cozymase did not accumulate during the carbohydrate metabolism of brain in presence of nembutal, and that the oxidation of reduced cozymase by methylene blue catalyzed by flavoprotein was not affected by nembutal. This indicates that the block is not at the position suggested in (1). The oxidation of lactate by yeast is also inhibited by nembutal. The fact that the yeast lactic enzyme, which like the enzyme in animal tissues does not require cozymase for activity, was inhibited is further evidence that cozymase is not involved and that the block occurs at cytochrome b. It is possible that the narcotic

acts by binding the reduced flavoprotein with cytochrome b (or another intermediate) and that the affinity of nembital for this complex is greater than for the succinic dehydrogenase-cytochrome b complex which is not affected by low concentrations of narcotics.

L. E. GILSON (Chem. Abstr.).

New Ideas on Mechanism of Narcosis. Valázquez, B. L., and Elio Membrado, F. J. [*Farmacoterap. actual* (Madrid), **1**, No. 5, 28-33 (1944).]

The action of acetylcholine on *in vitro* muscle preparations of the frog and leech in the presence of chloral hydrate, thiamine, and morphine hydrochloride is described. Cerebrospinal fluid drawn from the cisterna magna of the anesthetized dog has less acetylcholine than normal. It is suggested that the immediate mechanism of narcosis involves the inhibition of acetylcholine synthesis by the direct action of the narcotic on cell metabolism.

B. A. (Chem. Abstr.).

Electrocardiographic Studies During Convulsions Produced by Metrazole and Azoman (3-ethyl-4-cyclohexyl 1,2,4-triazole). de Haene, A., Delaunois, A. L., and Pannier, R. (Univ. Gand, Belgium). [*Arch. intern. pharmacodynamie*, **69**, 309-47 (1944).]

Azoman produces changes similar to metrazole on the human electrocardiogram, namely, tachycardia and changes in the T-wave and the S-T interval. Intravenous injection of 1.0 mgm. into frogs causes augmentation of the T-wave which is abolished when the cord is destroyed. 5 to 20 mgm. causes irregularities in the Q-R-S complex and depression of the T-wave. This occurs in normal as well as in sympathectomized frogs and also in those with the cord destroyed. The small doses increase the rate and amplitude of the beat, and the large ones depress. Strychnine behaves like small doses of metrazole. Azoman (1.0 mgm.) causes disappearance of the T-wave in normal frogs and a decrease in amplitude in frogs with the cord destroyed. In both cases, a small increase in the Q-R-S complex occurs. Azoman (5-20 mgm.) produces bradycardia and changes in the Q-R-S complex and T-waves whether the cord is destroyed or not or the frog is sympathectomized. In the dog, azoman causes tachycardia, shortening of the P-R and S-T intervals, and increase in the T-wave followed by a depression.

M. L. C. BERNHEIM (Chem. Abstr.).

Localization and Origin of the Convulsions Produced by Metrazole and Coramine. ten Cate, J., and Swijgman, D. W. (Univ. Amsterdam, Holland). [*Arch. intern. pharmacodynamie*, **70**, 293-306 (1945).]

Metrazole (27 mgm./kgm.) injected intraperitoneally causes convulsions in cats. Removal of the motor cortex prevents convulsions, and in decapitate cats at least twice the dose is necessary to produce them. 80 mgm./kgm. coramine intravenously produce convulsions in both normal and decorticated cats. In decapitated animals smaller doses are effective, indicating that coramine acts primarily on the spinal cord.

M. L. C. BERNHEIM (Chem. Abstr.).

The Alleged Convulsive Action of Pyridoxine. Saviano, Mario (Univ. Naples). [*Boll. soc. ital. biol. sper.*, **16**, 763-4 (1941).]

In mice, rats, and rabbits extremely heavy doses of pyridoxine increased neuromuscular excitability and occasionally provoked transient clonic spasms. Blood Ca and phosphate were not affected; blood sugar was slightly increased.

L. E. GILSON (Chem. Abstr.).

Morphine Habituation and Abstinence in the Light of Kravkov's Theory of Stages in Toxic Action. Gorovoi-Shaltan, V. A. [*Farmakol. i Toksikol.*, **7**, No. 6, 26-30 (1944).]

Clinical evidence supports the following data concerning morphine effects in three stages, where + = stimulation, - = depression, + - = collapse:

	PHASE I. Euphoric (incipient).	PHASE II. Narcotic (saturation).	PHASE III. Abstinence (final).
Cortex	+	—	+ —
Subcortical	—	—	+
Vegetative nervous system :			
Parasympathetic	+	+	+
Sympathetic	—	—	+
Endocrine glands :			
Parathyroid and pancreas, thyroid	+	+	—
Suprarenal, cerebral appendage, reproductive glands	—	—	+

The mode of administering morphine influences both the rate of development and the duration of the first phase. Clinical results in studies of habituation and abstinence proved to be most informative when studied in the light of Kravkov's theory of phases in toxic action.

JULIAN F. SMITH (Chem. Abstr.).

The Effect of Glutamic Acid on the Hydrogen Ion Concentration (pH) of the Urine in petit mal Types of Epilepsy. Spangler, Ralph H. (2221 S. Broad St., Philadelphia, Pa.). [*Ann. Allergy*, **3**, 241-57 (1945).]

Administration of 1.5-4.5 gm. of dl-glutamic acid-HCl daily resulted in urine with pH 4 on 59 of 114 days. d-Glutamic acid-HCl maintained pH 4 on 89 of 121 days in doses of 4.64-11.6 gm. Natural (+)-glutamic acid was less effective in doses of 10 gm.

H. L. MASON (Chem. Abstr.).

Humoral Changes After Insulin Therapy. Delay, Jean, Soulairac, A., and Jouannais, S. (Univ. Paris). [*Compt. rend. soc. biol.*, **139**, 460-2 (1945).]

In human subjects given enough insulin to produce coma after about 3 hours, blood sugar descended to 36 mgm. per cent., alkali reserve decreased to 54 volumes per cent., blood proteins increased a little (maximum value observed was 8.8 gm./100 c.c.), and serum lipides showed a marked increase. Normal conditions were restored within an hour after administration of glucose.

L. E. GILSON (Chem. Abstr.).

Action of Transcerebral Electrophoresis of Calcium on the Ovaries of the Rat Before and After Hypophysectomy. Bourguignon, Georges (Coll. France). [*Compt. rend. soc. biol.*, **139**, 568-70 (1945); cf. *C. A.*, **40**, 1594³.]

Two positive pad electrodes were placed on the eyes and the negative electrode on the base of the occiput, and 0.5-0.6 ma. d.c. was applied for 10-45 minutes. In intact rats passage of the current for 3-4 minutes produced turgescence first of the graafian follicles then of the entire ovary, and dilation of the blood vessels of the uterine horns. The maximum effect was reached in approximately 10 minutes. If the current was continued for 15 minutes or longer the turgescence and congestion gradually disappeared. In rats hypophysectomized 5-10 days previously no such effects were produced by the current.

L. E. GILSON (Chem. Abstr.).

Neutralization of Nerve-exciting Effects of Caffeine by Thiamine and Adrenaline. Chauchard, Paul, and Mazoué, Henriette (École hautes études, Paris). [*Compt. rend. soc. biol.*, **139**, 640-1 (1945); cf. *C. A.*, **40**, 1932¹, 1933⁵, 3528⁵.]

Like the sugars, either adrenaline or thiamine counteracts the effect of caffeine on nerve chronaxia.

L. E. GILSON (Chem. Abstr.).

Influence of Acute and Chronic Carbon Monoxide Poisoning on the Activity of Higher Nerves in Animals. Gorsheleva, L. S. [*Farmakol. i Toksikol*, **7**, No. 5, 47-51 (1944).]

Chronic poisoning by CO in doses too small to be detected by blood tests can be diagnosed by the method of conditioned reflexes. There is evidence of direct

action on the central nervous system, with sharper reaction than in mild single-dose poisoning. The earliest effects in chronic CO poisoning include cortical changes in the upper parts of the central nervous system. Trophic changes in the skin also occur.

JULIAN F. SMITH (Chem. Abstr.).

Idiopathic Hypoparathyroidism with Mental Deterioration: Effect of Treatment on Intellectual Function. Mortell, E. J. (Univ. of Virginia, Charlottesville). [*J. Clin. Endocrinol.*, **6**, 266-74 (1946).]

Serum Ca rose from 4.5 to 10.2, inorganic P fell from 9.6 to 3.1 mgm. per cent., and alkaline phosphatase fell from 5.6 to 3.8 Bodansky units during several months' treatment of a case of idiopathic hypoparathyroidism in a girl 19 years old with CaCl_2 and vitamin D given orally. The mental deterioration which had developed as the disease progressed showed no improvement. Intracerebral calcification was shown by X-ray examination.

KATHRYN KNOWLTON (Chem. Abstr.).

Adrenal Function and Cholesterol Metabolism in Narcosis. Abelin, I. (Hallerianum Inst., Univ. Bern). [*Helv. Physiol. Pharmacol. Acta*, **4**, 1-9 (1946) (in German).]

In rats and guinea-pigs anesthesia by inhalation of Et_2O or CHCl_3 or by injection of numal causes a temporary increase of 100 per cent. or more in the cholesterol content of the adrenals. In guinea-pigs, blood cholesterol decreases as the adrenal cholesterol increases. Other known effects of narcosis on blood components are discussed.

L. E. GILSON (Chem. Abstr.).

Pharmacology of Some Sympathomimetic Drugs Given by Cisternal Puncture (Dogs). Velázquez, B. Lorenzo, and de Armijo Valenzuela, M. [*Farmacoterap. actual* (Madrid), **1**, No. 2, 29-34 (1944).]

Chloralosed dogs were given injections of 0.125-0.5 mgm. of adrenaline, 10-20 mgm. of ephedrine, or 2.5-5 mgm. of amphetamine, direct into the cisterna magna, blood pressure and respiration changes being recorded. The effect was in the order, ephedrine greater than amphetamine, greater than adrenaline. Repeated injections of the same or of the other drugs were also carried out, and the results are discussed.

B. A. (Chem. Abstr.).

Expectorant Action of Parasympathomimetic Drugs. Boyd, Eldon M., and Lapp, M. Shirley (Queen's Univ., Kingston, Canada). [*J. Pharmacol.*, **87**, 24-32 (1946).]

Approximately 400 animals, including albino rats, guinea-pigs, rabbits, cats and dogs were arranged for collection of respiratory tract fluid (RTF). Eleven parasympathomimetic drugs, acetylcholine bromide, acetyl- β -methylcholine chloride (mécholyl), carbaminoylcholine chloride (carbachol), β -methylcholine urethan (urecholine), fur-furyltrimethylammonium iodide (furmethide), physostigmine, prostigmine, pilocarpine, arecoline, and the dimethylurethans of m-isopropyl-p-dimethylaminophenol methiodide and p-dimethylaminothymol methiodide, were given subcutaneously in a range of doses. Practically all of the drugs increased the volume output of RTF, some to over 1,000 per cent. Atropine abolished this effect when produced by pilocarpine, selected as an example of the group. Section of the cervical vagus nerve had no effect on the action of pilocarpine in cats. Pilocarpine was as effective in decerebrate as in urethanized cats. The mean specific gravity of cat RTF was slightly lowered by parasympathomimetic drugs, and the relative viscosity was increased. In general, the chloride content of RTF was increased by the drugs.

L. E. GILSON (Chem. Abstr.).

Sympathomimetic Amines: The Relation of the Structure to their Action and Inactivation. Beyer, Karl H. (Sharp and Dohme, Inc., Glenolden, Pa.). [*Physiol. Rev.*, **26**, 169-97 (1946).]

The formation of pressor substances with a basic β -phenylethylamine nucleus is discussed. The nature of the etiologic agents in hypertension is considered as well as the hypothetical relation of dopa to essential hypertension. This naturally led to the use of phenol oxidase (tyrosinase) in the treatment of hypertension but the effects were shown to be non-specific. Much interest centers in quinones as

antipressor agents. It was shown that 2-methyl-1,4-naphthoquinone (having vitamin K activity) reduces blood pressure of acutely hypertensive rats, but the quinones are not effective in human cases of hypertension or in dogs with renal hypertension. The mode of action of sympathomimetic amines is not well understood but more is known about the mechanism of their inactivation. Amine oxidase is widely implicated in this inactivation. The presence of amine oxidase in the body, particularly in the liver, determine whether pharmacologically active derivatives of β -phenylethylamine are effective and are excreted as such when administered by mouth. Derivatives, wherein the NH_2 group is on the terminal C of the side chain, are deaminated and are not active or excreted as such unless a hepatotoxic agent has been administered previously. But those in which the NH_2 group does not have the terminal position on the side chain are not appreciably deaminated and are active orally. There is a certain rough parallelism between rate of deamination and pressor activity. The relation of the ascorbic-dehydroascorbic acid system to the deamination of sympathomimetic agents is discussed, as well as the inactivation by conjugation. The renal excretion of the sympathomimetic amines depends upon the mode of inactivation. Since phenylethylamine derivatives, where the NH_2 is not on a terminal C, are refractory to deamination, they are generally excreted as such. But p-hydroxy derivatives in part, and compounds with a catechol nucleus predominantly, are excreted in conjugated form. As pressor agents, even the best of the aliphatic amines is less active than ephedrine and all demonstrate tachyphylaxis. In the presence of an aromatic nucleus, the NH_2 group on the side chain should be removed at least one C atom; aniline has no pressor activity while β -phenylethylamine has maximum activity. Substitution of alkyls or aryls on the α or β carbon reduces, abolishes, or reverses the sympathomimetic effect of the agent. Substitution of an alkyl group on the NH_2 -N practically always decreases the pressor effect. The m-OH is the strongest while the o-OH compound is the weakest, but if 2 OH groups are introduced into the nucleus, the pressor activity depends on their mutual relation as well as on the relation to the side chain. The true sympathomimetic drugs have the o-dihydroxy substitution in the m- and p-positions. Arterenol, β -(3,4-dihydroxyphenyl)- β -hydroxyethylamine is more active than epinephrine and is supposed to be sympathin.

S. MORGULIS (Chem. Abstr.).

Toxicity of Sulfanilamide on Higher Nervous Activity. Gantt, W. Horsley, and Marshall, E. K., jun. (Johns Hopkins Med. School, Baltimore, Md.). [Bull. Johns Hopkins Hosp., 77, 104-15 (1945).]

Sulfanilamide in doses ranging from 0.2 to 1.2 gm./kgm. body weight (in excess of therapeutic dosages) has a depressing action upon all conditioned reflexes in two dogs with well-established salivary conditional reflexes and in two with cerebellar motor reflexes. The maximum effect is reached within 1 hour and disappears within 24 hours.

A. EDELMANN (Chem. Abstr.).

Suppression of the Neuromuscular Troubles of Experimental Chronic Alcoholism by Injection or Ingestion of Vitamins B₃ and B₄. Lecog, Raoul, Chauchard, Paul, and Mazoué, Henriette. [Compt. rend., 222, 414-6 (1946).]

Repeated amounts 5-10 gm./kgm./day, of alcohol were given to adult rats until they developed symptoms of polyneuritis. The neuromuscular conditions of the disease were not altered by giving thiamine or riboflavin, but they were improved by a combination of 100 γ of vitamin B₃ (nicotinamide) and 150 γ of B₄ (adenine).

J. R. PORTER (Chem. Abstr.).

